JAMMU AND KASHMIR PUBLIC SERVICE COMMISSION

RESHAM GHAR COLONY, BAKSHI NAGAR, JAMMU - 180001

Website: http://jkpsc.nic.in Jammu: 0191-2566533

email: cocjkpsc2017@gmail.com

Subject: Written Examinations for the posts of Professor & HOD/Associate Professor/Assistant Professor(s) in the School of Architecture and GCET in Higher Education Department 2023- Provisional Answer Key(s).

Notification No. PSC/Exam/S/2023/71
Dated: 29.10.2023

In pursuance of Rule 10 (c) of the Jammu & Kashmir Public Service Commission (Conduct of Examination) Rules, 2022, as amended upto date, the Provisional Answer Key(s) of Question Paper pertaining to the Written Examinations for the post(s) of **Professor & HOD/Associate Professor/Assistant Professor(s) [Applied Science and Humanities (Management), Mathematics, Bio. Med. Engg., Civil Engg., Electrical & Electronics, Computer Engg./Computer Science & Engg., Electronics & Communication Engg., Electrical Engg., Mechanical Engg. and Architecture] in the School of Architecture and GCET in Higher Education Department, held on 22.10.2023**, are hereby notified for seeking objections from candidates.

Provisional Answer Key Assistant Professor

[Applied Science and Humanities (Management)]

Test Booklet Question No. (Series A)	
Q1	A
Q2	C
Q3	C
Q4	B
Q5	C
Q6	C
Q7	B
Q8	B
Q9	B
Q10	C
Q11	A
Q12	D

Test Booklet Question No. (Series A)	
Q13	C
Q14	C
Q15	D
Q16	C
Q17	A
Q18	B
Q19	A
Q20	C
Q21	D
Q22	D
Q23	C
Q24	A

Test Booklet Question No. (Series A)	
Q25	C
Q26	A
Q27	B
Q28	A
Q29	D
Q30	C
Q31	B
Q32	A
Q33	C
Q34	B
Q35	C
Q36	D

Test Booklet Question No. (Series A)	
Q37	A
Q38	D
Q39	A
Q40	A
Q41	C
Q42	C
Q43	B
Q44	C
Q45	D
Q46	A
Q47	D
Q48	B
Q49	D
Q50	D
Q51	D
Q52	C
Q53	D
Q54	B
Q55	B
Q56	B
Q57	D
Q58	C
Q59	A
Q60	A
Q61	D
Q62	A
Q63	D
Q64	C

Test Booklet Question No. (Series A)	
Q65	D
Q66	B
Q67	D
Q68	B
Q69	A
Q70	D
Q71	A
Q72	B
Q73	D
Q74	A
Q75	C
Q76	B
Q77	A
Q78	D
Q79	B
Q80	C
Q81	A
Q82	A
Q83	B
Q84	A
Q85	C
Q86	B
Q87	D
Q88	C
Q89	C
Q90	C
Q91	A
Q92	B

Test Booklet Question No. (Series A)	
Q93	A
Q94	D
Q95	B
Q96	D
Q97	A
Q98	B
Q99	B
Q100	C
Q101	C
Q102	A
Q103	C
Q104	D
Q105	A
Q106	B
Q107	D
Q108	D
Q109	B
Q110	C
Q111	C
Q112	B
Q113	D
Q114	C
Q115	C
Q116	D
Q117	C
Q118	B
Q119	A
Q120	B

Provisional Answer Key Assistant Professor (Mathematics)

Test Booklet Question No. (Series A)	
Q1	D
Q2	C
Q3	B
Q4	A
Q5	D
Q6	A
Q7	D
Q8	C
Q9	B
Q10	D
Q11	D
Q12	B
Q13	D
Q14	C
Q15	C
Q16	C
Q17	D
Q18	A
Q19	B
Q20	B
Q21	D
Q22	B
Q23	B
Q24	A
Q25	D
Q26	C
Q27	B
Q28	D
Q29	B
Q30	C
Q31	D
Q32	B
Q33	A
Q34	C
Q35	B
Q36	C
Q37	A
Q38	D
Q39	C
Q40	B

Test Booklet Question No. (Series A)	
Q41	D
Q42	B
Q43	D
Q44	B
Q45	D
Q46	C
Q47	D
Q48	B
Q49	B
Q50	B
Q51	C
Q52	A
Q53	A
Q54	C
Q55	C
Q56	A
Q57	D
Q58	D
Q59	B
Q60	A
Q61	D
Q62	C
Q63	B
Q64	C
Q65	D
Q66	A
Q67	C
Q68	A
Q69	B
Q70	C
Q71	C
Q72	A
Q73	A
Q74	B
Q75	C
Q76	B
Q77	D
Q78	A
Q79	C
Q80	B

Test Booklet Question No. (Series A)	
Q81	C
Q82	C
Q83	C
Q84	D
Q85	A
Q86	C
Q87	A
Q88	C
Q89	C
Q90	A
Q91	A
Q92	D
Q93	D
Q94	B
Q95	B
Q96	D
Q97	B
Q98	A
Q99	D
Q100	B
Q101	A
Q102	C
Q103	C
Q104	A
Q105	D
Q106	C
Q107	B
Q108	D
Q109	B
Q110	D
Q111	D
Q112	C
Q113	A
Q114	C
Q115	C
Q116	B
Q117	D
Q118	C
Q119	A
Q120	B

Provisional Answer Key Assistant Professor (Bio. Med. Engg.)

Test Booklet Question No. (Series A)	
Q1	C
Q2	D
Q3	A
Q4	C
Q5	B
Q6	B
Q7	B
Q8	D
Q9	D
Q10	A
Q11	B
Q12	D
Q13	D
Q14	D
Q15	B
Q16	B
Q17	C
Q18	A
Q19	D
Q20	D
Q21	A
Q22	A
Q23	C
Q24	B
Q25	C
Q26	C
Q27	D
Q28	B
Q29	B
Q30	C
Q31	A
Q32	B
Q33	A
Q34	C
Q35	C
Q36	A
Q37	C
Q38	D
Q39	B
Q40	B

Test Booklet Question No. (Series A)	
Q41	A
Q42	A
Q43	D
Q44	A
Q45	A
Q46	A
Q47	B
Q48	C
Q49	B
Q50	A
Q51	D
Q52	C
Q53	B
Q54	D
Q55	B
Q56	C
Q57	A
Q58	D
Q59	C
Q60	B
Q61	D
Q62	D
Q63	B
Q64	D
Q65	D
Q66	C
Q67	C
Q68	C
Q69	D
Q70	D
Q71	D
Q72	B
Q73	D
Q74	A
Q75	D
Q76	D
Q77	B
Q78	C
Q79	B
Q80	B

Test Booklet Question No. (Series A)	
Q81	B
Q82	A
Q83	D
Q84	C
Q85	A
Q86	B
Q87	A
Q88	A
Q89	D
Q90	C
Q91	A
Q92	C
Q93	B
Q94	C
Q95	B
Q96	B
Q97	D
Q98	A
Q99	C
Q100	D
Q101	A
Q102	C
Q103	D
Q104	A
Q105	D
Q106	B
Q107	D
Q108	C
Q109	D
Q110	A
Q111	C
Q112	D
Q113	A
Q114	D
Q115	C
Q116	B
Q117	A
Q118	D
Q119	C
Q120	C

Provisional Answer Key Assistant Professor (Civil Engg.)

Test Booklet Question No. (Series A)	
Q1	B
Q2	A
Q3	C
Q4	D
Q5	B
Q6	A
Q7	A
Q8	A
Q9	C
Q10	B
Q11	C
Q12	C
Q13	B
Q14	A
Q15	B
Q16	B
Q17	C
Q18	D
Q19	C
Q20	D
Q21	D
Q22	B
Q23	B
Q24	B
Q25	C
Q26	C
Q27	B
Q28	A
Q29	A
Q30	D
Q31	A
Q32	C
Q33	C
Q34	B
Q35	A
Q36	A
Q37	B
Q38	C
Q39	D
Q40	B

Test Booklet Question No. (Series A)	
Q41	A
Q42	B
Q43	B
Q44	A
Q45	D
Q46	B
Q47	D
Q48	D
Q49	C
Q50	B
Q51	D
Q52	C
Q53	D
Q54	C
Q55	D
Q56	A
Q57	A
Q58	B
Q59	B
Q60	C
Q61	C
Q62	C
Q63	A
Q64	D
Q65	B
Q66	A
Q67	A
Q68	C
Q69	A
Q70	B
Q71	C
Q72	B
Q73	A
Q74	D
Q75	C
Q76	B
Q77	A
Q78	B
Q79	D
Q80	B

Test Booklet Question No. (Series A)	
Q81	A
Q82	D
Q83	B
Q84	D
Q85	C
Q86	D
Q87	B
Q88	C
Q89	D
Q90	C
Q91	D
Q92	A
Q93	B
Q94	C
Q95	D
Q96	C
Q97	A
Q98	D
Q99	A
Q100	A
Q101	B
Q102	C
Q103	A
Q104	A
Q105	B
Q106	D
Q107	C
Q108	D
Q109	B
Q110	A
Q111	A
Q112	A
Q113	D
Q114	C
Q115	B
Q116	C
Q117	D
Q118	A
Q119	C
Q120	C

Provisional Answer Key Assistant Professor (Electrical & Electronics)

Test Booklet Question No. (Series A)	
Q1	A
Q2	A
Q3	A
Q4	D
Q5	A
Q6	A
Q7	A
Q8	A
Q9	D
Q10	A
Q11	C
Q12	A
Q13	C
Q14	B
Q15	C
Q16	B
Q17	C
Q18	A
Q19	A
Q20	C
Q21	C
Q22	C
Q23	A
Q24	B
Q25	B
Q26	A
Q27	D
Q28	D
Q29	B
Q30	A
Q31	A
Q32	B
Q33	D
Q34	D
Q35	D
Q36	D
Q37	A
Q38	A
Q39	B
Q40	A

Test Booklet Question No. (Series A)	
Q41	C
Q42	B
Q43	A
Q44	A
Q45	B
Q46	D
Q47	A
Q48	A
Q49	A
Q50	B
Q51	A
Q52	A
Q53	D
Q54	A
Q55	A
Q56	A
Q57	C
Q58	C
Q59	B
Q60	A
Q61	A
Q62	C
Q63	A
Q64	B
Q65	A
Q66	A
Q67	B
Q68	A
Q69	A
Q70	B
Q71	A
Q72	A
Q73	D
Q74	D
Q75	A
Q76	B
Q77	B
Q78	B
Q79	A
Q80	D

Test Booklet Question No. (Series A)	
Q81	C
Q82	C
Q83	C
Q84	C
Q85	A
Q86	C
Q87	C
Q88	B
Q89	B
Q90	C
Q91	B
Q92	C
Q93	A
Q94	C
Q95	C
Q96	A
Q97	C
Q98	C
Q99	A
Q100	D
Q101	B
Q102	C
Q103	A
Q104	A
Q105	C
Q106	B
Q107	B
Q108	C
Q109	D
Q110	D
Q111	A
Q112	C
Q113	B
Q114	A
Q115	A
Q116	C
Q117	B
Q118	D
Q119	B
Q120	B

Provisional Answer Key Assistant Professor
(Computer Engg./Computer Science & Engg.)

Test Booklet Question No. (Series A)	
Q1	C
Q2	C
Q3	A
Q4	C
Q5	D
Q6	A
Q7	B
Q8	C
Q9	B
Q10	D
Q11	A
Q12	D
Q13	C
Q14	A
Q15	A
Q16	B
Q17	A
Q18	A
Q19	B
Q20	C
Q21	D
Q22	C
Q23	A
Q24	C
Q25	A
Q26	C
Q27	C
Q28	A
Q29	D
Q30	C
Q31	B
Q32	C
Q33	C
Q34	C
Q35	C
Q36	B
Q37	B
Q38	C
Q39	B
Q40	B

Test Booklet Question No. (Series A)	
Q41	C
Q42	C
Q43	C
Q44	C
Q45	D
Q46	D
Q47	B
Q48	A
Q49	C
Q50	D
Q51	D
Q52	B
Q53	C
Q54	C
Q55	C
Q56	A
Q57	B
Q58	B
Q59	A
Q60	D
Q61	A
Q62	C
Q63	C
Q64	A
Q65	A
Q66	A
Q67	C
Q68	D
Q69	A
Q70	A
Q71	A
Q72	D
Q73	D
Q74	B
Q75	A
Q76	C
Q77	A
Q78	C
Q79	C
Q80	B

Test Booklet Question No. (Series A)	
Q81	C
Q82	C
Q83	B
Q84	C
Q85	D
Q86	C
Q87	B
Q88	D
Q89	D
Q90	D
Q91	D
Q92	C
Q93	B
Q94	D
Q95	A
Q96	C
Q97	C
Q98	B
Q99	B
Q100	D
Q101	A
Q102	B
Q103	D
Q104	C
Q105	C
Q106	D
Q107	C
Q108	C
Q109	A
Q110	A
Q111	D
Q112	D
Q113	D
Q114	B
Q115	D
Q116	C
Q117	C
Q118	C
Q119	D
Q120	C

Provisional Answer Key Assistant Professor
(Electronics & Communication Engg.)

Test Booklet Question No. (Series A)	
Q1	D
Q2	A
Q3	B
Q4	C
Q5	B
Q6	D
Q7	D
Q8	B
Q9	C
Q10	A
Q11	B
Q12	B
Q13	A
Q14	C
Q15	A
Q16	C
Q17	C
Q18	A
Q19	C
Q20	D
Q21	B
Q22	C
Q23	A
Q24	D
Q25	C
Q26	C
Q27	B
Q28	C
Q29	C
Q30	C
Q31	D
Q32	A
Q33	B
Q34	A
Q35	D
Q36	C
Q37	D
Q38	C
Q39	C
Q40	D

Test Booklet Question No. (Series A)	
Q41	D
Q42	A
Q43	B
Q44	C
Q45	A
Q46	C
Q47	A
Q48	B
Q49	D
Q50	C
Q51	A
Q52	B
Q53	D
Q54	A
Q55	B
Q56	A
Q57	C
Q58	C
Q59	C
Q60	A
Q61	D
Q62	B
Q63	C
Q64	A
Q65	D
Q66	D
Q67	B
Q68	B
Q69	A
Q70	D
Q71	C
Q72	A
Q73	B
Q74	D
Q75	C
Q76	D
Q77	B
Q78	A
Q79	A
Q80	B

Test Booklet Question No. (Series A)	
Q81	C
Q82	C
Q83	A
Q84	D
Q85	D
Q86	A
Q87	C
Q88	B
Q89	B
Q90	C
Q91	D
Q92	C
Q93	C
Q94	B
Q95	C
Q96	A
Q97	A
Q98	B
Q99	C
Q100	A
Q101	D
Q102	B
Q103	A
Q104	C
Q105	C
Q106	A
Q107	C
Q108	C
Q109	B
Q110	B
Q111	D
Q112	D
Q113	D
Q114	A
Q115	B
Q116	D
Q117	D
Q118	D
Q119	A
Q120	B

Provisional Answer Key Assistant Professor (Electrical Engg.)

Test Booklet Question No. (Series A)	
Q1	B
Q2	B
Q3	D
Q4	D
Q5	D
Q6	D
Q7	A
Q8	B
Q9	B
Q10	A
Q11	B
Q12	C
Q13	D
Q14	A
Q15	A
Q16	A
Q17	C
Q18	C
Q19	D
Q20	D
Q21	A
Q22	A
Q23	D
Q24	A
Q25	D
Q26	C
Q27	B
Q28	A
Q29	A
Q30	B
Q31	A
Q32	B
Q33	A
Q34	A
Q35	B
Q36	C
Q37	A
Q38	A
Q39	A
Q40	C

Test Booklet Question No. (Series A)	
Q41	B
Q42	A
Q43	A
Q44	C
Q45	B
Q46	B
Q47	C
Q48	C
Q49	B
Q50	D
Q51	A
Q52	D
Q53	B
Q54	C
Q55	B
Q56	D
Q57	C
Q58	D
Q59	C
Q60	D
Q61	A
Q62	C
Q63	D
Q64	B
Q65	B
Q66	A
Q67	B
Q68	B
Q69	B
Q70	A
Q71	B
Q72	B
Q73	A
Q74	B
Q75	A
Q76	C
Q77	B
Q78	A
Q79	B
Q80	C

Test Booklet Question No. (Series A)	
Q81	C
Q82	C
Q83	D
Q84	A
Q85	D
Q86	D
Q87	A
Q88	B
Q89	C
Q90	B
Q91	A
Q92	B
Q93	B
Q94	C
Q95	B
Q96	C
Q97	B
Q98	A
Q99	A
Q100	A
Q101	C
Q102	A
Q103	A
Q104	B
Q105	C
Q106	A
Q107	D
Q108	D
Q109	B
Q110	B
Q111	D
Q112	C
Q113	B
Q114	C
Q115	A
Q116	D
Q117	C
Q118	A
Q119	C
Q120	A

Provisional Answer Key Assistant Professor (Mechanical Engg.)

Test Booklet Question No. (Series A)	
Q1	D
Q2	C
Q3	D
Q4	C
Q5	A
Q6	C
Q7	D
Q8	C
Q9	B
Q10	C
Q11	D
Q12	D
Q13	D
Q14	B
Q15	C
Q16	A
Q17	C
Q18	C
Q19	A
Q20	A
Q21	D
Q22	D
Q23	C
Q24	C
Q25	C
Q26	C
Q27	C
Q28	A
Q29	D
Q30	C
Q31	B
Q32	D
Q33	A
Q34	B
Q35	C
Q36	D
Q37	C
Q38	A
Q39	C
Q40	A

Test Booklet Question No. (Series A)	
Q41	A
Q42	B
Q43	B
Q44	D
Q45	A
Q46	D
Q47	B
Q48	A
Q49	C
Q50	C
Q51	D
Q52	A
Q53	B
Q54	A
Q55	D
Q56	C
Q57	B
Q58	A
Q59	D
Q60	B
Q61	D
Q62	C
Q63	B
Q64	A
Q65	B
Q66	D
Q67	C
Q68	B
Q69	B
Q70	B
Q71	D
Q72	C
Q73	B
Q74	A
Q75	A
Q76	C
Q77	A
Q78	B
Q79	C
Q80	D

Test Booklet Question No. (Series A)	
Q81	C
Q82	B
Q83	B
Q84	B
Q85	A
Q86	C
Q87	B
Q88	B
Q89	B
Q90	C
Q91	C
Q92	B
Q93	B
Q94	A
Q95	C
Q96	C
Q97	B
Q98	B
Q99	C
Q100	C
Q101	B
Q102	D
Q103	D
Q104	C
Q105	C
Q106	A
Q107	D
Q108	D
Q109	C
Q110	D
Q111	C
Q112	B
Q113	D
Q114	C
Q115	A
Q116	A
Q117	B
Q118	D
Q119	B
Q120	B

Provisional Answer Key Professor & HOD/Associate Professor/Assistant Professor (Architecture)

Test Booklet Question No. (Series A)	
Q1	C
Q2	B
Q3	D
Q4	A
Q5	C
Q6	B
Q7	A
Q8	C
Q9	D
Q10	B
Q11	D
Q12	A
Q13	A
Q14	D
Q15	C
Q16	C
Q17	D
Q18	A
Q19	D
Q20	D
Q21	B
Q22	A
Q23	D
Q24	B
Q25	D
Q26	A
Q27	C
Q28	A
Q29	D
Q30	D
Q31	B
Q32	C
Q33	D
Q34	C
Q35	D
Q36	C
Q37	D
Q38	A
Q39	B
Q40	D

Test Booklet Question No. (Series A)	
Q41	C
Q42	A
Q43	B
Q44	D
Q45	A
Q46	C
Q47	D
Q48	A
Q49	A
Q50	C
Q51	D
Q52	B
Q53	B
Q54	D
Q55	B
Q56	C
Q57	A
Q58	D
Q59	B
Q60	C
Q61	B
Q62	D
Q63	C
Q64	D
Q65	C
Q66	A
Q67	B
Q68	D
Q69	A
Q70	A
Q71	B
Q72	D
Q73	B
Q74	B
Q75	C
Q76	C
Q77	A
Q78	C
Q79	A
Q80	A

Test Booklet Question No. (Series A)	
Q81	D
Q82	C
Q83	D
Q84	A
Q85	D
Q86	A
Q87	C
Q88	A
Q89	C
Q90	B
Q91	D
Q92	B
Q93	A
Q94	B
Q95	B
Q96	A
Q97	C
Q98	D
Q99	B
Q100	C
Q101	B
Q102	D
Q103	B
Q104	B
Q105	D
Q106	A
Q107	C
Q108	C
Q109	D
Q110	C
Q111	A
Q112	B
Q113	B
Q114	A
Q115	C
Q116	B
Q117	D
Q118	A
Q119	D
Q120	C

The candidates are advised to refer to **Question Booklet (Series A)** to match the corresponding question(s) in their respective Question Booklet Series and if any candidate feels that the key to any of the question(s) is/are wrong, he/she may represent on prescribed format/proforma annexed as **Annexure-A** along with the documentary proof/evidence **(hard copies only)** and fee of Rs.500/- per question in the form of Demand Draft drawn in favour of **COE, J&K PSC** (refundable in case of genuine/correct representation) to the Controller of Examinations, Jammu & Kashmir Public Service Commission, from Monday i.e. 30.10.2023 to 31.10.2023. **The candidates are further advised to clearly mention the question(s) objected to with reference to its serial number as it appears in the Question Booklet of Series A of the provisional answer key(s).**

Further, any objection/application not accompanied by the requisite Demand Draft of Rs.500/- as prescribed, shall not be considered/entertained under any circumstances. Candidates are, in their own interest, advised to adhere to these instructions and not submit any objection unaccompanied by the Demand Draft as required under extant rules.

The Commission shall not entertain any such representation(s) after the expiry of the stipulated period i.e. after 31.10.2023 (Tuesday), 05.00 pm.

The provisional answer key(s) are available on the website of the Commission http://www.jkpsc.nic.in.

29/10/23

(Dr. Varnika Raj), JKAS
Under Secretary
J&K Public Service Commission

No. PSC/Ex-Secy/2023/60 Dated: 29.10.2023

Copy to the: -

1. Director, Information and Public Relation, J&K for publication of the notice in all leading newspapers published from Jammu/Srinagar.
2. P.S. to Hon'ble Chairman, J&K Public Service Commission for information of the Hon'ble Chairman.
3. P.S. to Hon'ble Member, Shri _____ for information of the Hon'ble Member.
4. P. A. to Secretary, J&K Public Service Commission for information of the Secretary.
5. P.A. to Controller of Examinations, J&K Public Service Commission.
6. Main file/Stock file/Notice Board.

Annexure-A

Representation regarding objection(s) to any Question/Answer pertaining to the Written Test conducted for the post(s) of Professor & HOD/Associate Professor/Assistant Professor(s) [Applied Science and Humanities (Management), Mathematics, Bio. Med. Engg., Civil Engg., Electrical & Electronics, Computer Engg./Computer Science & Engg., Electronics & Communication Engg., Electrical Engg., Mechanical Engg. and Architecture], 2023 held on 22.10.2023

(NOTE: USE SEPARATE FORMS FOR SEPARATE QUESTIONS)

Discipline : _____

Name of the Applicant : _____

Roll No. : _____

Correspondence Address : _____

Contact/Mobile No. : _____

Date of Application: _____.10.2023

Demand Draft No. date : _____

Candidates Account No.(16 digit) & IFSC Code : _____

_____

Question No. in Series A	Details of the Objection	Resource Material (copy to be enclosed)	Details of the Website (if any)
Correct Answer/Option as per candidate :			

Signature of the Candidate

Note : Application for each question/answer shall be made on separate page in the given format, otherwise the first question entered in the format shall only be considered.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

Booklet Serial No. 208045

Test Booklet Series

TEST BOOKLET
ASSISTANT PROFESSOR APPLIED SCIENCE AND HUMANITIES

A

Written Test - 2023
(01)

Time Allowed: Two Hours *Maximum Marks: 120*

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT*** **write** ***anything else*** on the Test Booklet.
4. This Test booklet contains **120** items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer /Response Sheet provided. *See directions in the Response Sheet.*
6. ***All*** items carry equal marks.
7. Before you proceed to mark in the Answer /Response Sheet, the response to various items in the Test Booklet, you have to fill in some particulars in the Answer /Response Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer /Response Sheet***. You are permitted to take away with you the Test Booklet and ***Candidate's Copy of the Response Sheet .***
9. Sheets for rough work are appended in the Test Booklet at the end.
10. While writing Centre, Subject and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN".**
11. **Penalty for wrong answers:**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).

    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **(0.25)** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

1. Which management theory highlights the importance of worker's efficiency?
   A) Scientific Management Theory
   B) Administrative Management Theory
   C) Modern Management Theory
   D) Need hierarchy Theory

2. What does MBE stand for in management?
   A) Management by Employees
   B) Management by Exclusion
   C) Management by Exception
   D) Management by Entrepreneur

3. Modern Management theories emphasize:
   A) Control over employees
   B) Strict hierarchical structures
   C) Efficient use of resources
   D) All of the above

4. What is the primary objective of MBO?
   A) Improving sales
   B) Improving organizational efficiency
   C) Reducing costs
   D) None of these

5. Elton Mayo's Neo Classical theory of Human Relations Perspective emphasized the importance of:
   A) Centralized decision making and autocratic leadership
   B) The role of technology in streamlining production process
   C) Understanding and addressing the social and psychological needs of employees
   D) Implementing strict rules and regulations to ensure discipline

6. Which strategic tool can be used for analyzing the product portfolio?
   A) SWOT
   B) PEST
   C) BCG
   D) None of these

7. Which elements of the McKinsey 7S Framework refers to the culture within a company?
   A) Systems
   B) Style
   C) Structure
   D) Skill

8. A company following a diversification strategy aims to:
   A) Concentrate on a single product or market segment
   B) Expand its business into unrelated industries
   C) Strengthen its position into the existing market through partnerships
   D) Divest non core business units to focus on its primary industry

9. Apple's new laptops and desktops use its own chips, instead of processors from Intel. Which of the following is correct in this context :
   A) This is an example of forward integration
   B) This is an example of backward integration
   C) This is an example of increase in supplier power
   D) This is an example of decrease in buyer power

10. According to Porter's five forces, which of the following are the consequences of increased rivalry amongst competing firms?
   A) Purchase incentives
   B) Ancillary services
   C) Both A and B
   D) None of the above

11. Which quadrant of the Ansoff Matrix involves expanding a company's market share through strategies like price adjustments, promotions and improved customer service?
   A) Market Penetration
   B) Market Development
   C) Product Development
   D) Diversification

12. Who introduced the concept of Value Chain Analysis?
   A) Philip Kotler
   B) Peter Drucker
   C) Peter Senge
   D) Michael Porter

13. Which type of organizational structure violates the unity of command?
    A) Functional structure
    B) Divisional structure
    C) Matrix structure
    D) None of these

14. Team structure is most appropriate for organizations with
    A) A simple and straightforward organizational structure
    B) A diverse range of products and services
    C) A strong emphasis on product development and innovations
    D) A preference for a flat hierarchical structure

15. Line and staff organization is a modification of the line organization where staff personnel:
    A) Reports directly to top management
    B) Have authority over line personnel
    C) Are responsible for decision implementation
    D) Provide advice and support to the line personnel

16. Which of the following a barrier to effective delegation:
    A) Clearly defining the roles and responsibilities of subordinates
    B) Open and effective communication between superiors and sub ordinates
    C) Fear of losing control over decision making and outcomes
    D) Encouraging employee empowerment and autonomy

17. Which method is wage payment is based on the quantity of output produced
    A) Piece rate wages
    B) Time based wages
    C) Bonus based wages
    D) None of these

18. The process of providing introductory knowledge to new employees regarding the organization, its culture and policies is known as
    A) Organizational awareness
    B) Induction
    C) Recruitment
    D) Training

19. Which factors should be considered for developing a good wage system?
    A) Organization's financial capability, wages and employee performance
    B) Employees seniority and educational qualifications
    C) Cost of living and organization's profitability
    D) Employee performance and job satisfaction

20. Which stage of the Recruitment and Selection process involves outlining the responsibilities and requirement for a vacant position?
    A) Job analysis
    B) Interviewing candidates
    C) Job description
    D) None of these

21. What does the term "upskilling" refer to?
    A) Training employees to use new softwares
    B) Training new employees to replace the retiring ones
    C) Providing the resources needed to work from home
    D) Training employees to perform multiple job roles

22. What is the primary purpose of job evaluation:?
    A) to establish a hierarchical structure for job position
    B) To compare salaries of employees abased on their qualifications
    C) To determine the level of job satisfaction among employees
    D) To establish a fair and equitable wage structure

23. Which of the following is not a product related decision?
    A) Adding new Features
    B) Changing brand name
    C) Decreasing Price
    D) None of the above

24. Market research helps businesses
    A) Develop new products
    B) Manage financial resources
    C) Manage human resources
    D) None of the above

25. Which term refers to establishing a unique image of a product in mind of consumers?
    A) Segmentation
    B) Targeting
    C) Positioning
    D) None of these

26. What marketing objective can be attained using sales promotion?
    A) To stimulate immediate purchases
    B) Create awareness and interest in the product
    C) To build long term brand loyalty
    D) All of the above

27. What is meant by "market testing" in the context of new Product development?
    A) Understanding consumer needs
    B) Confirmation that the product meets its intended use
    C) Defining the market potential
    D) None of these

28. Integrated Marketing Communication(IMC) refers to:
    A) Single, consistent message to the target audience from all sources
    B) Mix of advertising, sales promotion and public relation activities
    C) Wide range of product options and variations
    D) None of these

29. During the maturity stage of product life cycle, how should companies differentiate their product from competitors?
    A) Price increase
    B) Offer product variations
    C) Extensive advertising and promotions
    D) Minimal product improvements

30. Which factor can negatively impact the success of entrepreneurship?
    A) High educational qualification of the entrepreneur
    B) Strong government regulations
    C) Lack of demand for innovative products
    D) Availability of venture capital funding

31. Which function of an entrepreneur involves coordinating resources and assuming risks to achieve business goals?

A) Innovation

B) Planning

C) Networking

D) Financing

32. What is the difference between and intrapreneur and entrepreneur?

A) Intrapreneurs are employees who develop innovative ideas within an existing organization, while entrepreneurs start their own ventures

B) Intrapreneurs focus on maximizing profits, while entrepreneurs focus on social impact

C) Intrapreneurs are limited to implementing incremental changes while entrepreneurs can pursue radical innovations

D) Intrapreneurs have access to more resources and funding compared to entrepreneurs

33. A successful entrepreneur takes calculated risks and is willing to:

A) Avoid innovation and new ideas

B) Rely solely on government support

C) Continuously learn and adapt to changing markets

D) Solely focus on profit making without social responsibility

34. What is the primary purpose of a business pitch?

A) To provide detailed projections and revenue models

B) To attract potential investors and secure funding for the project

C) To outline the entire project plan in a single presentation

D) To highlight the achievements and experience of an entrepreneur

35. Which type of Entrepreneur continuously starts and operates multiple ventures, seeks significant financial returns from each venture's success?

A) Lifestyle entrepreneur

B) Technopreneur

C) Serial entrepreneur

D) Social entrepreneur

36. A micro enterprise in classified based on:
   A) Number of employees
   B) The level of technology used
   C) The volume of annual sales
   D) The level of investment in plant and machinery

37. Which government initiative in India aims to provide financial and non-financial support to small scale industries for their modernization, technology upgradation and capacity extension
   A) Credit Guarantee Fund Scheme for Micro and Small enterprises
   B) Make in India
   C) MUDRA
   D) None of these

38. What is an essential condition for successful collective bargaining:
   A) Strict adherence to management's decision without negotiation
   B) Strong competition among trade unions
   C) A one sided approach from management
   D) Open and transparent communication between worker's and management

39. Which entrepreneurship policy supports entrepreneurship among women and SC & ST communities
   A) Stand-Up India
   B) Start Up India
   C) Skill India
   D) Make in India

40. Project planning and scheduling techniques like CPM/PERT is useful for entrepreneurs because it helps them
   A) Identify potential risks and uncertainties in the project
   B) Develop a marketing strategy and brand positioning for the product
   C) Calculate breakeven point and profitability
   D) Implement quality control and assurance measures

41. Which legal form of industrial ownership provides limited liability protection to its owners while allowing them to enjoy the benefits of a separate legal entity?
   A) Sole proprietorship
   B) Partnership
   C) Joint Stock company
   D) Cooperative society

42. Which of the following are pull factors which influence women entrepreneurship?
    A) Dearth of bread winner
    B) Sudden fall in family income
    C) To gain economic independence
    D) All of the above

43. Lean startup is an entrepreneurial approach that focuses on:
    A) Developing products and services with excessive feature to cater to a wider audience
    B) Rapid experimentation and validates learning to build a successful business
    C) Seeking external funding and investment at the early stages of the startup
    D) Solely relying on traditional marketing strategies for business growth

44. What is one of the primary functions of an entrepreneur?
    A) Avoiding risks at all costs
    B) Focus on short term goals
    C) Identifying and seizing business opportunities
    D) Restricting gsrowth Andexpansion

45. When conducting technical analysis for a new business venture, what does the technical analysis primarily focus on?
    A) Evaluating the potential market demand for the product or service
    B) Analyzing the financial resources required to start the business
    C) Assessing the technical skills and expertise of the entrepreneur
    D) Examining the feasibility and viability of business idea

46. Price elasticity of demand measures
    A) Change in quantity demanded when there is a change in price
    B) Change in quantity supplied when there is a change in price
    C) Both A and B
    D) None of these

47. What is the role of a central bank of a country?
    A) Implementing fiscal policy
    B) Regulating commercial banks
    C) Managing international trade
    D) None of these

48. In ordinal utility analysis, indifference curve represents:
   A) Consumer's budget constraint
   B) Consumer's level of satisfaction from consuming a good
   C) Consumer's total utility derived from all goods
   D) Consumer's preference for one good over another

49. Which of the following are positive indicators in the first stage of a trade cycle,
   A) Income decreases
   B) Loan repayment on time
   C) Increase in frequency of investments
   D) All of the above

50. The WEAK Axiom of Revealed Preference (WARP) states that:
   A) The consumer's choices are not influenced by advertising
   B) Consumers always choose the cheapest option available
   C) Consumers do not reveal their preferences through choices
   D) If a bundle is chosen, no other bundle can be preferred to it

51. The concept of rationality in the revealed Preference Theory implies that consumers
   A) Always choose goods that are expensive and luxurious
   B) Always choose the most expensive option available
   C) Only make choices based on their income levels
   D) Make choices that are consistent and based on their preferences

52. Ordinal utility is based on:
   A) Price and income levels
   B) Numerical measurement of utility
   C) Ranking of preferences
   D) Perfectly competitive markets

53. Indifference curve represents all the combinations of goods that give a consumer :
   A) No utility
   B) Minimum utility
   C) Maximum utility
   D) Constant utility

54. What is meaning of surplus in a country's balance of payments?
   A) The country's imports are greater than exports
   B) The country's exports are greater than imports
   C) The country if facing economic crisis
   D) The country's imports and exports are equal

55. The term "trade" refers to
    A) Ratio of imports to exports
    B) Ratio of export prices to import prices
    C) Balance between imports and exports in international trade
    D) None of these

56. IMF offers assistance to member countries facing balance of payments problems often in the form of:
    A) Grants
    B) Low interest loans
    C) Equity investments in country's key sectors
    D) Subsidies for export oriented industries

57. The modern theory of international trade argues that trade can be influenced by factors such as economies of scale, product differentiation and:
    A) Terms of trade
    B) Factor proportions
    C) Comparative advantage
    D) Absolute advantage

58. The main source of funding for the World Bank for supporting development projects in developing countires comes from:
    A) Member countries annual contributions
    B) Profits from investments in global markets
    C) Borrowing from international financial markets
    D) Donations from philanthropic organizations

59. Which of the following causes inflation?
    A) Increase in money supply
    B) Decrease in money supply
    C) Decrease in income
    D) Increase in product supply

60. Fiscal federalism refers to
    A) Division of fiscal responsibilities between central and State Government
    B) Taxation policies of a country
    C) Distribution of wealth in a country
    D) None of these

61. The method of measuring national income that adds up the value of all final goods and services produced by primary, secondary and tertiary sectors in an economy is called

A) Saving method

B) Income methods

C) Production methods

D) Product method

62. What does Wagner's theory of public expenditure suggest?

A) Government expenditure decreases during periods of economic growth

B) Government expenditure increases during periods of economic growth

C) Government expenditure does not depend on the economic development

D) None of these

63. An optimal tax system is based on

A) Benefit principle

B) Proportional taxation

C) Regressive taxation

D) Ability to pay principle

64. What influences money multiplier?

A) Required reserve ration

B) Excessive reserve ration

C) Both A and B

D) None of these

65. What are the difficulties in measuring national income accurately?

A) Incomplete data and estimation errors

B) Underground economy and informal sector

C) Variation in exchange rates

D) All of the above

66. What is meant by vertical imbalance in central-state financial relations?

A) Difference in taxes

B) Unequal distribution of financial resources

C) Difference in spending patterns

D) Imbalance is revenue collection

67. Credit creation refers to:

A) The process of issuing credit cards to customers

B) Transfer of credit from one account to another

C) Government's role in regulating credit in economy

D) None of these

68. Which of the following is not a function of production planning and control?

A) Resource allocation

B) Employee training

C) Quality control

D) Scheduling production activities

69. What is the primary objective of the Kanban system?

A) To minimize waste

B) To increase production costs

C) To maximize output

D) To improve employee morale

70. Which type of layout is best suited for mass production?

A) Fixed position layout

B) Process layout

C) Cellular layout

D) Product layout

71. How does TQM promote employee involvement in quality improvement efforts?

A) By allowing employee participation in decision making

B) By implementing strict quality control measures

C) By encouraging employees to focus on individual tasks

D) By providing extensive training on quality management techniques

72. Which type of inventory system relies on classification and prioritization of inventory items based on their value

A) Just-in-Time(JIT)

B) ABC Analysis

C) Material Requirements Planning (MRP)

D) Economic Order Quantity (EOQ)

73. Which of the following factors is not considered a criterion for selecting plant location?
   A) Government regulations
   B) Access to raw materials
   C) Access to markets and transportation
   D) Proximity to competitors

74. Which costs are minimized using the Economic Order Quantity (EOQ) model?
   A) Ordering costs and holding costs
   B) Carrying costs and shortage costs
   C) Holding costs and setup costs
   D) Ordering costs and setup costs

75. In the decision making process, the stage where pros and cons of alternatives are reviewed is called,
   A) Identifying the problem
   B) Generating alternatives
   C) Selecting the best alternative
   D) Implementing the decision

76. The weighted average Cost of Capital is calculated by:
   A) Taking the sum of the cost of equity and cost of debt
   B) Taking the average of cost of equity and cost of debt
   C) Multiplying the cost of equity and cost of debt
   D) Dividing the cost of equity by cost of debt

77. Monte carlo simulation is used to
   A) Analyse project risks and uncertainities
   B) Evaluate the financial performance of a company
   C) Analyse investment opportunities
   D) None of these

78. Which factor(s) influence group decision making?
   A) Groupthink and social pressure
   B) Consensus and majority voting
   C) Individual preferences and biases
   D) All of the above

79. The concept of capital structure in a company refers to:
   A) Total financial resources
   B) The composition of liabilities
   C) The value of equity shares
   D) Combination of tangible And intangible assets

80. Which theory of capital structure suggests that a firm's value is not affected by change in company's debt components?.
   A) Net income theory
   B) Traditional theory
   C) Operating income theory
   D) Modigliani-Miller theory

81. What characterizes non programmed decision making?
   A) Complexity, uncertainity and ambiguity
   B) Certainity, heuristics
   C) intuition, pattern recognition
   D) none of these

82. EBIT-EPS analysis helps in determining level of EBIT required to,
   A) to maximize company's earnings per share (EPS)
   B) to generate sales and maximize profits
   C) cover fixed expenses
   D) All of the above

83. Effective business communication involves
   A) Using complex language to impress others
   B) Understand the receiver's perspectives and providing clear messages
   C) Only using formal communication networks
   D) Ignoring feedback from users

84. Which of the following is an example of upward communication?
   A) Reports
   B) Memos
   C) Notices
   D) All of the above

85. Which part of speech mechanism is concerned with the voice quality that results from vibrations?

A) Respiration
B) Phonation
C) Resonance
D) Articulation

86. Which of the following require listening actively and considering different viewpoints?

A) Monologue
B) Group discussion
C) Interview
D) Telephonic conversation

87. Phonetics focuses on

A) The study of the meaning and structure of words
B) The syntax and rules of a language
C) The relationship between sound and spelling in different languages
D) The analysis of speech sounds

88. Effective speaking skills involve:

A) Speaking quickly to save time
B) Using jargons and complex language
C) Tailoring message to the audience's needs and preferences
D) Avoiding eye contact for a more professional appearance

89. Writing sales letter writing involves:

A) Making direct claims for defective products or service
B) Inquiring about potential job opportunities
C) Persuade reader to purchase a product
D) Expressing gratitude and appreciation to customers

90. What is the purpose of diagonal communication in an organization?

A) To facilitate communication between different departments at same level
B) To facilitate informal communication among employees
C) To transmit information between different levels and departments
D) To monitor and control employee behavior

91. Which type of communication barrier occurs when the sender uses technical jargons that the receiver cannot understand?

A) semantic barrier
B) cultural barrier
C) psychological barrier
D) physical barrier

92. Which communication model considers communication as a two-way process involving the sender, receiver and feedback loop?

A) Liner communication model
B) Transactional communication model
C) Interactive communication model
D) None of these

93. Which of the following terms refers to "learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object"?

A) Learning
B) Attitude
C) Personality
D) Motivation

94. Which of the following factors do not affect group performance?

A) Group cohesion
B) Group size
C) Formal leadership
D) None of these

95. According to equity theory of motivation,

A) Motivation is a result of need fulfillment
B) Employee motivation at work is driven by sense of fairness
C) Performance is a result of consequences
D) None of these

96. Which type of leadership style is most suitable for new employees who do not have any prior work experience?

A) Participative leadership
B) Transactional leadership
C) Transformational leadership
D) Autocratic leadership

97. Which theory of learning emphasizes the role of consequences in shaping behavior
   A) Classical conditioning
   B) Operant conditioning
   C) Cognitive theory
   D) Instrumental conditioning

98. Which stage in the process of Organization Development involves collecting data through interviews, surveys and observations to identify areas for improvement?
   A) Entry
   B) Diagnosis
   C) Feedback
   D) Intervention

99. Which model of Organizational Behavior emphasizes the importance of understanding the interactions among individuals, groups and organization as a whole?
   A) Contingency model
   B) System model
   C) Human relations model
   D) Classical model

100. Which personality trait refers centers on ability of an individual to cope with stress?
   A) Conscientiousness
   B) Openness to experience
   C) Neuroticism
   D) Agreeableness

101. Which term refers to the systematic investigation, collection and analysis of information?
   A) Experiment
   B) Data analysis
   C) Research
   D) sampling

102. Which research design involves gathering information about present existing condition?
   A) Descriptive research
   B) Causal research
   C) Correlational research
   D) None of these

103. Which measure of skewness is used to describe asymmetry of a data distribution?

A) Positive skewness
B) Negative skewness
C) Skewness coefficient
D) Skewness ratio

104. Sampling means following a sequence of stages. Which ONE of the following stages should come before the others

A) Proceed with field work
B) Find suitable source for the population members
C) Define the people of interest
D) Examine the objective of study

105. In which scale of measurement does the rule of assigning numbers provides information regarding the category to which the data belongs?

A) Nominal scale
B) Ordinal scale
C) Ratio scale
D) Interval scale

106. A researcher wants to conduct research to examine whether there is significant difference between the age of male and .female entrepreneurs or not. Which statistical test can be used to test this,

A) Chi square test
B) T test
C) ANOVA
D) None of these

107. Which sample size determination technique should be used to ensure that the sample is representative of the population?

A) Convenience sampling
B) Effect size calculation
C) Ransom sampling
D) None of these

108. What is the advantage of using a factorial design for an experimental study?

A) It ensures high internal validity
B) It requires a smaller sample size
C) It eliminates the need for random assignment
D) None of these

109. Which method of data collection is suited for collecting data from a large number of participants quickly?

A) Observations
B) Surveys
C) Experiment
D) Interviews

110. A manager at Swiggy wants to know,

a. The population of new cities to be chosen for expansion
b. Swiggy's image/positioning in the market place

Which research approach should be used by the manager?

A) Government statistics; survey with customers
B) Internal records; survey with customers
C) Government statistics; survey with customers and non customers
D) Internal records; survey with customers and non customers

111. For a given data, mean is 65 and Standard deviation is 5. What is the coefficient of variation?

A) 8.3 %
B) 8 %
C) 7.7 %
D) .005

112. For a given data, Mean is 3, Median is 2 and mode of 1. Which type of distribution does this data represent?

A) The distribution is normal
B) The distribution is positively skewed
C) The distribution is negatively skewed
D) The distribution is symmetrical

113. Which measure indicates average distance of scores from the mean?

A) Range
B) Variance
C) Z score
D) Mean Absolute deviation

114. A feel of deep respect and awe is known as

A) Glory
B) Respect
C) Reverence
D) Love

115. Which of the following is the role of education and sanskar in human consciousness?
A) Promoting Prosperity
B) Providing basic guidelines
C) Enabling transformation
D) Ensuring harmony in society

116. Which of the following are the sources of imagination?
A) Sensation
B) Pre conditioning
C) Natural acceptance
D) All of the above

117. Which of the following is not a level of awareness of human consciousness as suggested by Sigmund Freud?
A) Conscious
B) Preconscious
C) Subconscious
D) Unconscious

118. How does competence in professional ethics impact an individual's professional conduct
A) Competence in professional ethics only applies to specific professions
B) It ensures integration of ethical principles into decision making and conduct
C) It has no bearing on individual's conduct
D) None of these

119. Which of the following is not a need of SELF And body?
A) Harmony
B) Trust
C) Respect
D) Care

120. What is the significance of harmony in family and society?
A) Fulfillment of basic needs
B) Creation of trust and respect
C) Development of consciousness
D) Achievement of happiness and prosperity

ROUGH WORK

ROUGH WORK

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

Booklet Serial No. 208501

Test Booklet Series

A

TEST BOOKLET
ASSISTANT PROFESSOR
BIO MEDICAL ENGINEERING
Written Test - 2023
(03)

Time Allowed: Two Hours ***Maximum Marks: 120***

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT*** **write** ***anything else*** on the Test Booklet.
4. This Test booklet contains **120** items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer /Response Sheet provided. *See directions in the Response Sheet.*
6. ***All*** items carry equal marks.
7. Before you proceed to mark in the Answer /Response Sheet, the response to various items in the Test Booklet, you have to fill in some particulars in the Answer /Response Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer /Response Sheet***. You are permitted to take away with you the Test Booklet and ***Candidate's Copy of the Response Sheet .***
9. Sheets for rough work are appended in the Test Booklet at the end.
10. While writing Centre, Subject and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN".**
11. **Penalty for wrong answers:**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).

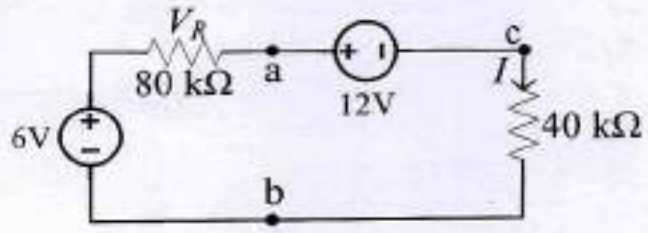
    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **(0.25)** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

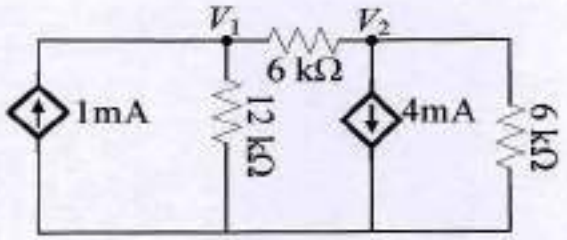
DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

1. Find I and V_{ab} in the following circuit?



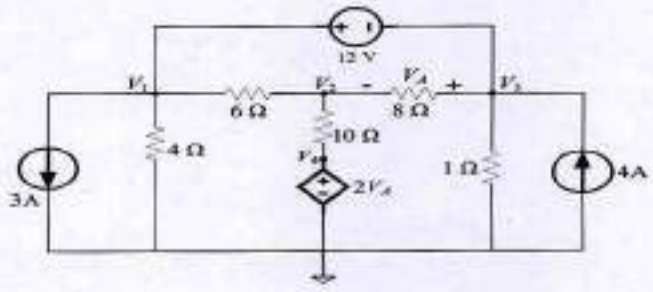
A) 1 mA, -5 V,
B) -1 mA, 10 V,
C) -0.05 mA, 10 V,
D) 0.05 mA, 5 V

2. Find the voltages V_1 ad V_2.



A) 15V, -6 V,
B) 6 V, -6 V,
C) -15 V, 6 V,
D) -15 V, -6 V

3. Choose the correct combination from below options for V_1, V_2, V_3 and V_4, respectively.



A) 9.68, 1.45, -2.32, -7.54,
B) 9.68, -2.32, 1.45, -7.54,
C) -7.54, 9.68, 1.45, -2.32,
D) 9.68, -2.32, -7.54, 1.45.

4. Which of the following options is correct based on Assertion (A) and Reason (R).
Assertion (A): If the voltages across R, L and C elements connected in series in an ac circuit are 300 V, 100 V, and 500 V respectively, the total voltage applied will be 500 V.
Reason (R): The applied voltage in the LCR series circuit is equal to the maximum voltage existing across any of these elements.

A) Both A and R are true, and R is the correct explanation of A
B) Both A and R are true, but R is not a correct explanation of A
C) A is true, but R is false
D) A is false, but R is false

5. What is the rms value of rectangular voltage wave with amplitude of 100 V?

A) $0\sqrt{2}$ V, B) 100 V,
C) 110 V D) $(100/\sqrt{2})$V

6. The impedance of a circuit is given by Z = 3 + j4. Its conductance will be:

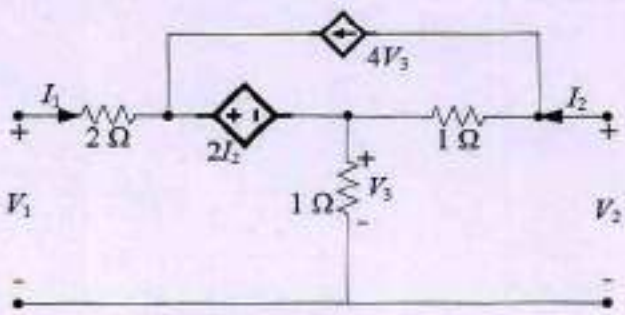
A) 3/7, B) 3/25,
C) 3/4 D) 1/3

7. ABCD parameters of the following 2-port network are

A) $\begin{bmatrix} 3.5+j2 & 20.5 \\ 20.5 & 3.5-j2 \end{bmatrix}$ B) $\begin{bmatrix} 3.5+j2 & 30.5 \\ 0.5 & 35-j2 \end{bmatrix}$

C) $\begin{bmatrix} 10 & 2+j0 \\ 2+j0 & 10 \end{bmatrix}$ D) $\begin{bmatrix} 7+j4 & 0.5 \\ 30.5 & 7-j4 \end{bmatrix}$

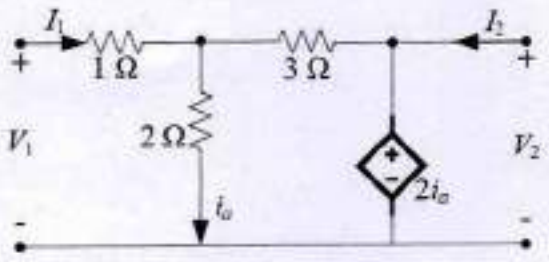
8. The Z-parameter of the below shown circuit will be



A) $\begin{bmatrix} 3 & -3 \\ -2 & 2 \end{bmatrix}$, B) $\begin{bmatrix} -3 & -3 \\ 2 & -2 \end{bmatrix}$,

C) $\begin{bmatrix} -2 & 3 \\ -3 & 2 \end{bmatrix}$ D) $\begin{bmatrix} 3 & 3 \\ -3 & -2 \end{bmatrix}$

9. The short circuit parameter matrix of the below shown circuit will be



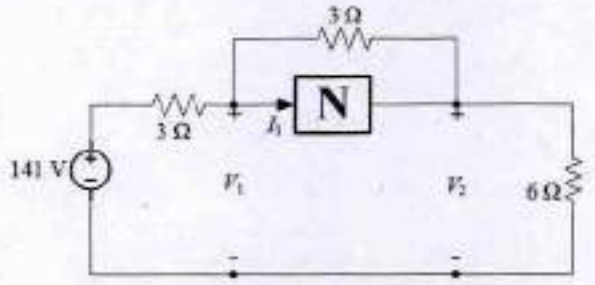
A) $\begin{bmatrix} 0 & -2 \\ -2 & 1 \end{bmatrix}$

B) $\begin{bmatrix} -3 & -1/2 \\ -1/2 & 2 \end{bmatrix}$

C) $\begin{bmatrix} 1 & 2 \\ -2 & 0 \end{bmatrix}$

D) None of these

10. For the two-port network N shown below, Z-parameter matrix is $\begin{bmatrix} 2 & 1 \\ 1 & 4 \end{bmatrix}$. The value of I_1 in Amperes is



A) 24 A, B) 9 A,

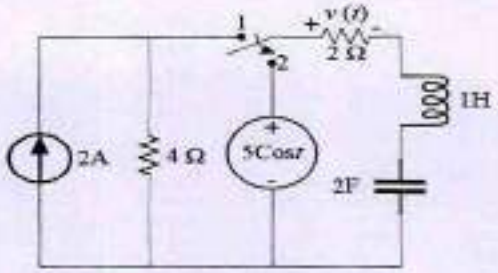
C) 16 A D) 0 A

11. Find the value of 'K' for the system to be stable $G(S)H(S) = \dfrac{K(1-S)}{S(S^2+5S+9)}$

A) -2, B) 6,

C) 10 D) 0

12. At t=0, the switch moves from 1 to 2. The form of the transient part of $v(t)$ for $t>0$ is



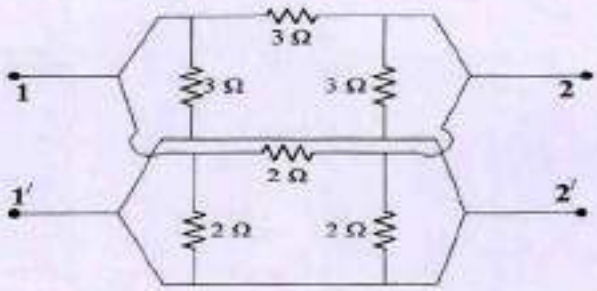
A) $(A_1+A_2)e^{-0.5t}$,

B) $A_1\text{Cos}(0.5t)+A_2\text{Sin}(0.5t)$,

C) $A_1e^{-t}\text{Cos}(0.5t)+A_2e^{-t}\text{Sin}(0.5t)$,

D) $A_1e^{-1.7t}+A_2e^{-0.29t}$

13. In the h-parameter model of the 2-port network given in the figure shown, the value of h_{22} = ?



A) 0.8 Ω^{-1},

B) 5/6 Ω^{-1},

C) 1.66 Ω^{-1}

D) 1.25Ω^{-1}

14. In a series circuit on resonance, following will occur

A) $X_L=X_C$,

B) $V_L=V_C$,

C) Z=R and $V=V_R$

D) All of these

15. The impedance at resonance offered by a parallel resonant circuit is _____.

A) Maximum given by 1/CR

B) Maximum given by L/CR

C) Minimum given by L/CR

D) Minimum given by 1/CR

16. If τ is time constant and ω is the applied frequency, a low pass RC filter acts as a pure integrator when

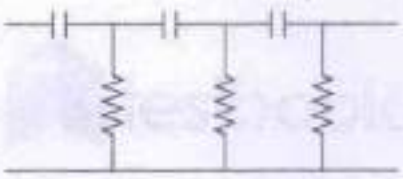
A) $\omega\tau = 0$,

B) $\omega\tau >> 1$,

C) $\omega\tau = 1$,

D) $\omega\tau << 1$

17. RC network shown in the given figure can provide maximum theoretical phase shift of



A) 90°,

B) 180°,

C) 270°,

D) 360°

18. In a LCR circuit capacitance is changed from C to 5C for the resonant frequency to remain unchanged, the inductance should be changed from L to value:

A) L/5,

B) 5L,

C) L/2,

D) None of these

19. When the frequency applied to a series LRC circuit is increased, the impedance of the circuit:

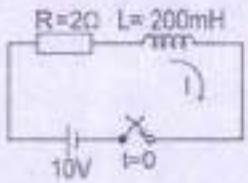
A) First increases and then decreases after reaching a maximum value

B) Decreases

C) Increases

D) First decreases and then increases after reaching a minimum value

20. In the given circuit the switch is closed at time t = 0. The time taken for the circuit current to reach steady-state value is



A) 0.2 sec,

B) 5 sec,

C) 2 sec,

D) 0.5 sec

21. A 10-μF capacitor in series with a 1-MΩ resistor is connected across a 100-V DC supply. The initial rate of rise of voltage across the capacitor is _____.

A) 10 V/s,

B) 0.01 V/s,

C) 1 V/s,

D) 0.1 V/s

22. A system described by the following differential equation $\frac{d^2y}{dt^2}+3\frac{dy}{dt}+2y=x(t)$ is initially at rest. For input $x(t)=2u(t)$, the output $y(t)$ is

A) $(1-2e^{-t}+e^{-2t})u(t)$

B) $(1+2e^{-t}-2e^{-2t})u(t)$

C) $(0.5+e^{-t}+1.5e^{-2t})u(t)$

D) $(0.5+2e^{-t}+2e^{-2t})u(t)$

23. The unit impulse response of a system is . $h(t)=e^{-t}$, *for* $t\geq 0$ For this system, the steady-state value of the output for unit step input is equal to

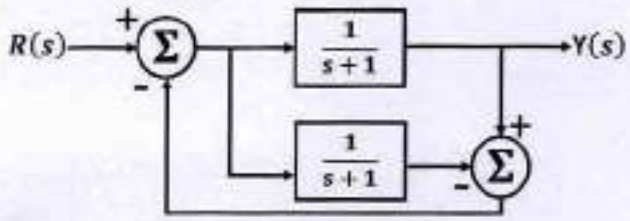
A) -1

B) 0

C) 1

D) ∞

24. The transfer function $Y(s)/R(s)$ of the system shown is



A) 0

B) $\frac{1}{s+1}$

C) $\frac{2}{s+1}$

D) $\frac{2}{s+3}$

25. Consider a system with the transfer function $G(s) = \frac{s+6}{Ks^2+s+6}$. Its damping ratio will be 0.5 when the value of K is

A) $2/6$

B) 3

C) $1/6$

D) 6

26. A causal system having the transfer function $H(s) = \frac{1}{s+2}$ is excited with $10u(t)$. The time at which the output reaches 99% of its steady state value is

A) 2.7 *sec*

B) 2.5 *sec*

C) 2.3 *sec*

D) 2.1 *sec*

27. The output of a standard second-order system for a unit step input is given as $y(t) = 1 - \frac{2}{\sqrt{3}}e^{-t}\cos\left(\sqrt{3}t - \frac{\pi}{6}\right)$. The transfer function of the system is

A) $\frac{2}{(s+2)(s+\sqrt{3})}$

B) $\frac{1}{s^2+2s+1}$

C) $\frac{3}{s^2+2s+3}$

D) $\frac{4}{s^2+2s+4}$

28. An electromechanical closed-loop control system has the following characteristic equation; $s^3 + 6Ks^2 + (K+2)s + 8$. Where K is the forward gain of the system. The condition for closed loop stability is:

A) $K = 0.528$
B) $K = 2$
C) $K = 0$
D) $K = -2.258$

29. Consider the points $s_1 = -3+j4$ and $s_2 = -3-j2$ in the s-plane. Then, for a system with the open-loop transfer function $G(s)H(s) = \frac{k}{(s+1)^3}$

A) S_1 is on the root locus, but not S_2
B) S_2 is on the root locus, but not S_1
C) Both S_1 and S_2 are on the root locus
D) Neither S_1 nor S_2 is on the root locus

30. The 3-dB bandwidth of a typical second-order system with the transfer function $\frac{C(s)}{R(s)} = \frac{\omega_n^2}{s^2 + 2\xi\omega_n s + \omega_n^2}$, is given by

A) $\omega_n\sqrt{1-2\xi^2}$
B) $\omega_n\sqrt{(1-\xi^2)+\sqrt{\xi^4-\xi^2+1}}$
C) $\omega_n\sqrt{(1-2\xi^2)+\sqrt{4\xi^4-4\xi^2+2}}$
D) $\omega_n\sqrt{(1-2\xi^2)-\sqrt{4\xi^4-4\xi^2+2}}$

31. The impulse response $h[n]$ of a linear time-invariant system is given by $h[n]=u[n+3]+u[n-2]-2u[n-7]$ where $u[n]$ is the unit step sequence. The above system is

A) Stable but not causal
B) Stable and causal
C) Causal but unstable
D) Unstable and not causal

32. The sequence $x[n]=0.5^n u[n]$ is the unit step sequence, is convolved with itself to obtain $y[n]$. Then

$\sum_{n=-\infty}^{+\infty} y[n]$ is ----------

A) 2.5-3.5
B) 3.9-4.1
C) 4.7-5.9
D) 6-8.1

33. If the signal $x(t)=\frac{sin(t)}{\pi t}*\frac{sin(t)}{\pi t}$ with * denoting the convolution operation, then $x(t)$ is equal to

A) $\frac{\sin(t)}{\pi t}$

B) $\frac{\sin(2t)}{2\pi t}$

C) $\frac{2\sin(t)}{\pi t}$

D) $\left(\frac{\sin(t)}{\pi t}\right)^2$

34. A periodic signal $x(t)$ of period T_0 is given by $x(t)=\begin{cases} 1, |t|<T_1 \\ 0. T_1<|t|<\frac{T_0}{2} \end{cases}$ the dc component of $x(t)$ is

A) $\frac{T_1}{T_0}$

B) $\frac{T_1}{(2T_0)}$

C) $\frac{2T_1}{T_0}$

D) $\frac{T_0}{T_1}$

35. The impulse response of a system is $h(t)=tu(t)$. For an input $u(t-1)$, the output is

A) $\frac{t^2}{2}u(t)$

B) $\frac{t(t-1)}{2}u(t-1)$

C) $\frac{(t-1)^2}{2}u(t-1)$

D) $\frac{t^2-1}{2}u(t-1)$

36. The input-output relationship of a causal stable LTI system is given as $y[n]=\alpha y[n-1]+\beta x[n]$. If the impulse response $h[n]$ of this system satisfies the condition $\sum_{n=0}^{\infty} h[n]=2$, the relationship between α and β is

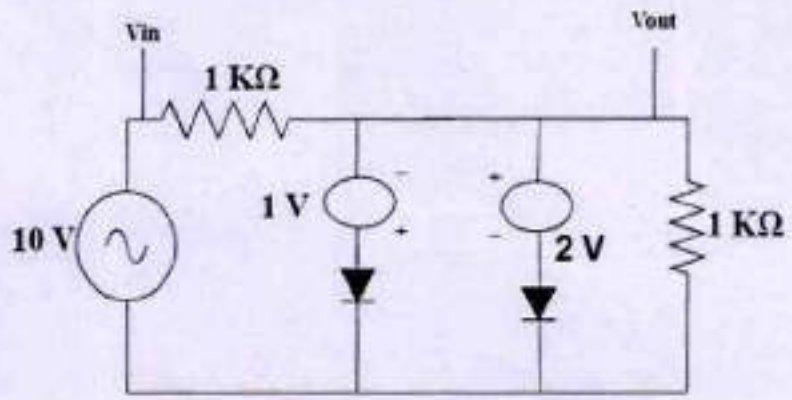
A) $\alpha=1-\frac{\beta}{2}$

B) $\alpha=1+\frac{\beta}{2}$

C) $\alpha=2\beta$

D) $\alpha=-2\beta$

37. You are working on the following circuit wherein the cut-in voltage of both the diodes, D1 and D2is 1V. You now decide to apply a sinusoidal input voltage of frequency 1 kHz and amplitude 10V. What will happen to the output voltage as a result of doing this?



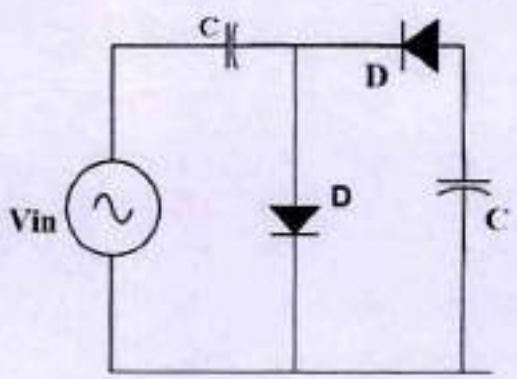
A) It will be a sinusoidal with amplitude of 5V.

B) It will be a half-wave rectified sinusoid of amplitude 5V .(only positive cycles)

C) It will be a half-wave rectified sinusoid of amplitude 5V.(only negative cycles)

D) It will be a full-wave rectified sinusoid of amplitude 5V.

38. Find the modulus of instantaneous average output value of the circuit given below.



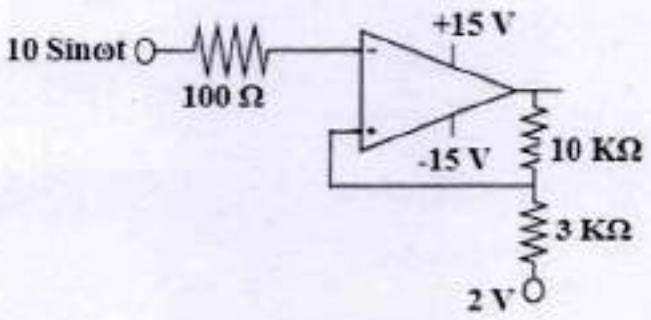
A) -2Vm V.

B) -2Vm/π V.

C) Vm/π V.

D) 2Vm V.

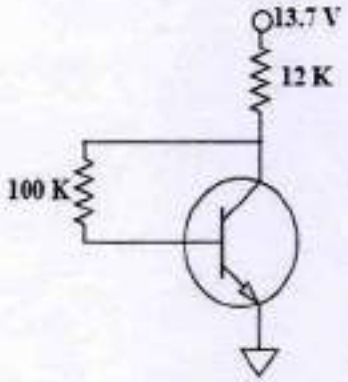
39. Find the hysteresis width for the following Op-amp circuit.



A) 5 V
B) 6.92 V
C) 3.08 V
D) 4 V

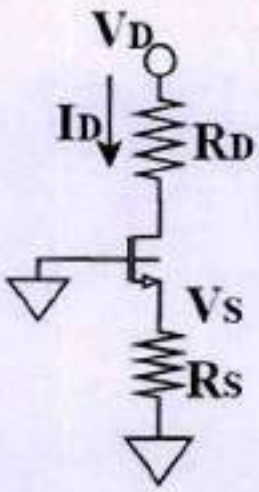
40. For a Shunt-Shunt negativefeedback topology, the value of input impedance:
A) Increases.
B) Decreases.
C) Increases then decreases.
D) Decreases then increases.

41. Find the value of Voltage gain of the following circuit. (Given $V_{BE} = 0.7$ V, Current gain = 100, $V_T = 25$ mV and the transistor is in Active mode)



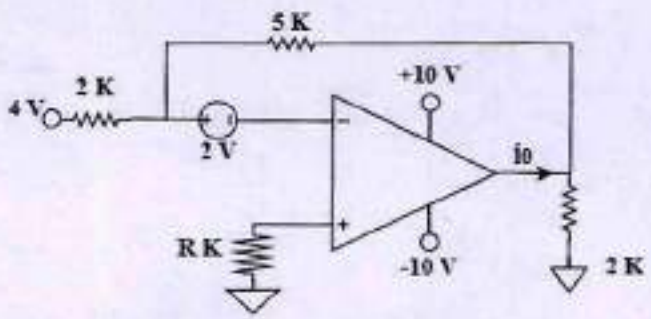
A) -8.89 V.
B) -5.6 V.
C) -12 V.
D) -3.2 V.

42. Find the value of R_D and Rs of the following MOSFET. (Given $I_D = 0.4$ mA, $V_D = 0.5$ V, Vt=0.7 V, Kn= 100 μA/V², L=1 μm, W= 32 μm and no channel length modulation)



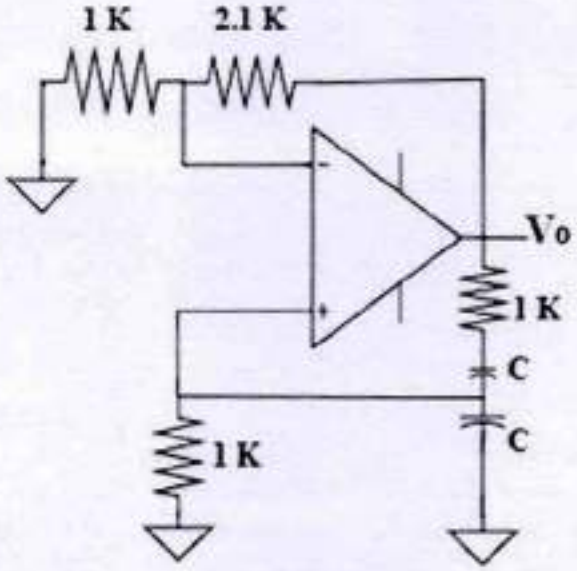
A) 3.25 K and 5 K
B) 4.2 K and 6 K
C) 1.2 K and 8 K
D) 3.25 K and 8 K

43. Find the value of i0.



A) -7 mA.
B) -5 mA.
C) -6 mA.
D) -3 mA.

44. Find the value of C required for sustained oscillation of frequency 1 KHz in the circuit below.



A) $1/2\pi$ μF.
B) $1/\pi$ μF.
C) π μF.
D) $1/6\pi$ μF.

45. The wavelength of the light radiated from GaAs laser is $860*10^{-10}$. Calculate the energy gap of the GaAs.

A) 1.43 eV.
B) 1.24 eV.
C) 1.69 eV.
D) 1.8 eV.

46. The effective mass of the electron is equal to thrice the effective mass of the hole, find the distance of Fermi level in an intrinsic semiconductor from the center of the forbidden band at room temperature.

A) Fermi level lies below the center at a distance of 0.0213 eV.
B) Fermi level lies above the center at a distance of 0.0213 eV.
C) Fermi level lies below the center at a distance of 0.0315 eV.
D) Fermi level lies above the center at a distance of 0.0315 eV.

47. In a n-type semiconductor Fermi level lies 0.3 eV below the conduction band at 300K. If the temperature is increased to 330K, find the new position of Fermi level.

A) 0.53 eV,
B) 0.3341 eV,
C) 0.841 eV,
D) 0.43 eV.

48. Consider a Si p-n junction at 300K with doping concentration of $N_a = 10^{16}$ /cm^3, $N_d = 10^{15}$ /cm^3, and built-in potential $V_{bi} = 0.635$ V. Calculate the space charge width

A) 0.53 μm.
B) 0.81 μm.
C) 0.951 μm.
D) 1.1 μm.

49. The transition capacitance of a step graded Si p-n junction diode is 20 pF at a reverse bias voltage of 5 V, and V0= 0.7 V. If reverse bias voltage is increased by 1 V, find the change in the capacitance.

A) 2.1 pF.
B) 1.55 pF.
C) 3.2 pF.
D) 4.3 pF.

50. In p-type Ge, acceptor concentration corresponds to 1 in 10^8 Ge atoms. If the effective mass of the hole is half of its true mass in room temperature, how far from the edge of the valence band is the Fermi level?

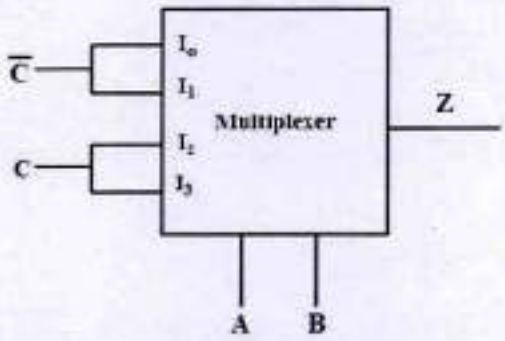
A) EF is 0.2562 eV above Ev.
B) EF is 0.2562 eV below Ev.
C) EF is 0.2562 eV below Ec.
D) EF is 0.2562 above Ec.

51. Three scattering mechanisms exist in a semiconductor. If only the first mechanism was present, the mobility would be 500 cm^2/V-sec. If only the second mechanism was present, the mobility would be 750 cm^2/V-sec. If only the third mechanism was present, the mobility would be 1500 cm^2/V-sec. Then the net mobility would be

A) 100 cm^2/V-sec.
B) 500 cm^2/V-sec.
C) 170 cm^2/V-sec.
D) 250 cm^2/V-sec.

52. Convert the decimal number $(74.6)_{10}$ into binary number system.
A) 1001010.1010
B) 1001010.1011
C) 1001010.1001
D) 1001010.1110

53. What is the value of output Z in 4×1 multiplexer shown in the figure below?



A) A XOR C
B) A XNOR C
C) B XOR C
D) B XNOR C

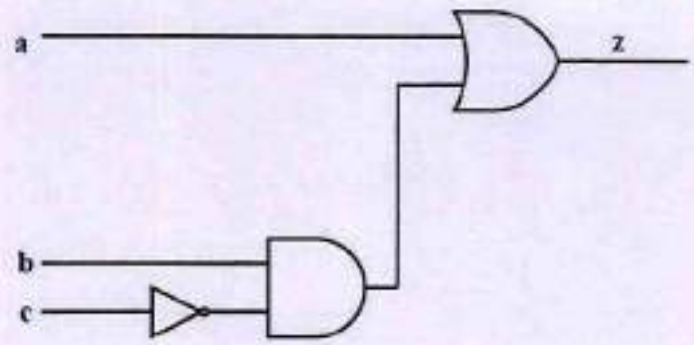
54. Simplify the expression $F(A,B,C,D)= \pi(0,1,2,4,5,6,8,10)$ using K-map.
A) (B+C).(A+D).(B+D)
B) (A+C).(A+B).(B+D)
C) (A+C).(A+D).(C+D)
D) (A+C).(A+D).(B+D)

55. The minimum number of 2-input NAND gates required to implement 2-input XNOR gate is
A) 4
B) 5
C) 6
D) 7

56. Convert gray code 11001010 into binary number.
A) 10001110
B) 10001111
C) 10001100
D) 10001000

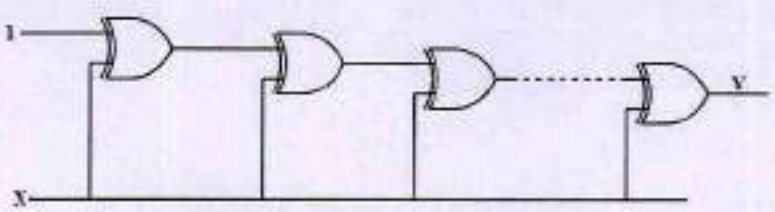
57. How many 3 × 8 decoder is used to construct 5 × 32 decoder?
A) 4
B) 5
C) 6
D) 7

58. Consider the Boolean function z (a,b,c)



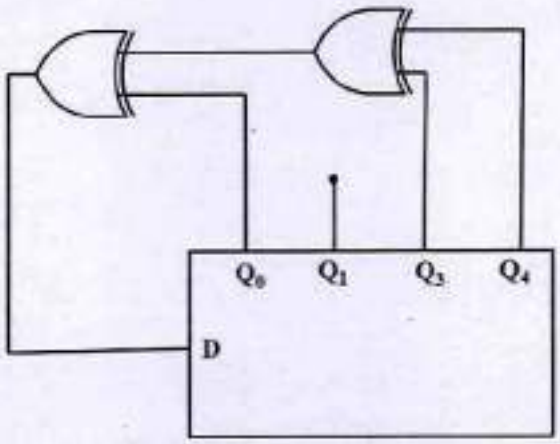
Which of the following min-term lists represent the circuit given above?
A) $\sum$ (0,1,2,3)
B) $\sum$ (1,4,5,7)
C) $\sum$ (3,5,7)
D) $\sum$ (4,6,7)

59. If the input to the digital circuit consisting of a cascade of 25 XOR gates is X then the output Y is equal to



A) X
B) 1
C) $\overline{X}$
D) 0

60. The initial count of the right shift register is given as 0001 at Q_0, Q_1, Q_2, Q_3,after how many clock pulses it will be back to its initial position.



A) 5 B) 6
C) 7 D) 8

61. A JK flipflop with J=1 and K=1 has 60 KHz clock input. The Q output is _____.
A) High constantly B) Low constantly
C) 60 KHz square wave D) 30 KHz square wave

62. Calculate the number of RAM memory chip to design 8 KB memory if memory size is 1024×1 bits.
A) 8 B) 16
C) 32 D) 64

63. The hardware interrupts which can be delayed when a higher priority interrupt has occurred at the same time is _____.
A) Non maskable interrupt B) Maskable interrupt
C) Normal interrupt D) None of these

64. Calculate the delay produced by the microprocessor on executing the following instructions. Considering the clock frequency of the microprocessor as 2MHz.

MVI C, FF H	7T
LOOP: DCR C	4T
JNZ LOOP	10T/7T

A) 1.5 ms B) 1.65 ms
C) 1.7 ms D) 1.8 ms

65. Which of the following addressing modes does not require operands?

A) Direct addressing mode

B) Indirect addressing mode

C) Register addressing mode

D) Implied addressing mode

66. LDA 5800H instruction is an example of _____ instruction.

A) 1 byte B) 2 byte

C) 3 byte D) 4 byte

67. For transducers, following statements are given:

a) An optical interferometer is useful for measuring extremely small motions

b) The damping ratio of a seismic instrument should be low for good dynamic performance

c) A rate gyro is a relative motion measuring device

d) A pneumatic motion transducer is non-linear over a wide range of motion

e) A piezoelectric accelerometer can only be used for static motion measurement

Choose the correct answer from the options given below:

A) (a) and (b) only B) (a) and (c) only

C) (a) and (d) only D) (c) and (e) only

68. The following statements pertain to Fibre optic sensors used for data acquisition:

S1: Affected by electromagnetic interference, and radiated signals.

S2: Compatible with fibre optic communication systems.

S3: They do not conduct any electric current.

S4: Suited for taking measurements in environments that are explosive in nature.

Identify the INCORRECT statement(s).

A) S4 only

B) S1 and S4

C) S1 only

D) S3 only

69. Consider the following statements for piezoelectric materials:

a) All piezoelectric materials are ferroelectric materials also.

b) Piezoelectric materials have a high value of dielectric constant.

Which of the above statements is/are correct?

A) A only
B) B only
C) Both A and B
D) Neither A nor B

70. What is the piezoelectric effect in a crystal?

A) Change in resistance because of temperature
B) Change of frequency because of temperature
C) Current is developed due to force applied
D) Voltage is developed because of mechanical stress

71. A piezoelectric transducer has a crystal capacitance of 10^{-9} F, cable capacitance of 5×10^{-10} F, and charge sensitivity of 15×10^{-6} C/cm. If the input resistance of the oscilloscope is 1 MΩ in parallel with $C = 15 \times 10^{-10}$ F, then what will be the voltage sensitivity?

A) 2000 V/cm
B) 3000 V/cm
C) 4000 V/cm
D) 5000 V/cm

72. Which of the following statements are correct?

a) If the intermediate frequency is too high, poor selectivity results even if sharp cutoff filters are used in the IF stage.

b) A high value of intermediate frequency increases tracking difficulties.

c) As the intermediate frequency is lowered, image frequency rejection becomes better.

d) A very low intermediate frequency can make the selectivity too sharp.

Choose the correct answer from the options given below:

A) a and b only

B) b and c only

C) c and d only

D) b and d only

73. Differential Amplifier with transistors or FETs pairs in it is known as _____?

A) Band Pass Amplifier
B) Operational Amplifier
C) High Pass Amplifier
D) DC Amplifier

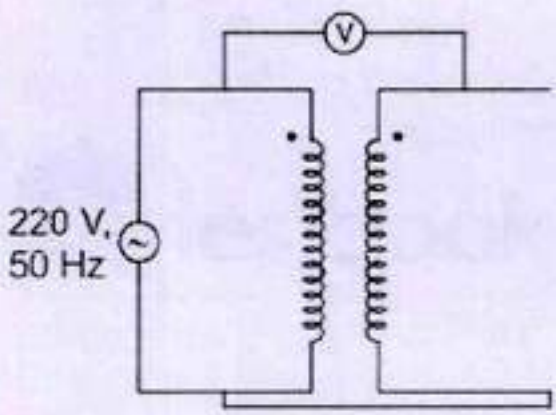
74. DC Chopper type Amplifiers are useful in _____?

A) Measuring Instruments
B) AC Amplification
C) Servo Drives
D) Impedance Matching

75. If the voltage across electrostatic voltmeter is increased by 10%, then deflecting torque is

A) Decreased by 10%
B) Increased by 10%
C) Decreased by 21%
D) Increased by 21%

76. The voltmeter in the circuit shown in the figure is ideal. The transformer has two identical windings with perfect coupling. The reading on the voltmeter will be



A) 440 V
B) 220 V
C) 110 V
D) Zero

77. Direction: It consists of two statements, one labeled as 'Statement (I)' and the others as 'Statement (II)'. You are to examine these two statements carefully and select the answer using the codes given below:

Statement (I): Electrostatic Wattmeter is not widely used commercially because of its inability to measure the power of high value.

Statement (II): It is used mainly for very small power measurements at high voltages and low power factors.

A) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)

B) Both Statement (I) and Statement (II) are individually true but Statement (II) is NOT the correct explanation of Statement (I)

C) Statement (I) is true but Statement (II) is false

D) Statement (I) is false but Statement (II) is true

78. A voltmeter with an internal resistance of 200 kΩ when connected across an unknown resistance reads 250 V. The milliammeter internal resistance = 0 connected in series with the above combination reads 10 mA. The actual value of the unknown resistance is _____

A) 25 kΩ

B) 200 kΩ

C) 28.56 kΩ

D) 20 kΩ

79. The difference between a sample statistic and the corresponding parameter is known as

A) Standard error

B) Sampling error

C) Systematic error

D) Probable error

80. A 5-ampere ammeter is designed to be accurate within ±1.5% at full scale. What is the value of the limiting error when the ammeter is used to measure a current of 2.1 ampere?

A) 3.89%

B) 3.57%

C) 4.28%

D) 2.38%

81. A polymer-based implant is facing degradation due to chain oxidation, scission, and cross-linking. Which common pre-implantation process can cause this type of degradation

A) Pre-sterilization cleaning
B) Gamma-irradation
C) Storage
D) Autoclaving

82. Which amongst the following is the most suspectable polymer to degradation through hydrolysis

A) Polyether
B) Polyethylene
C) Polypropylene
D) Polystyrene

83. The following statements describes the working of the detection system of a scanning electron microscope-

a) Everhart–Thornly (E-T) detector works by attracting escaped electrons (back scattered electrons-BSEs and all the secondary electrons-SEs)

b) A positively biased grid placed directly in front of a positively charged scintillator attracts SEs

c) A negative bias on the grid will result in only the BSEs being detected

Which of the above statements are correct?

A) All of the above
B) b and c
C) a and b
D) a and c

84. The following statements describe the theoretical concepts of X-Ray Diffraction analysis-

a) Miller indices are the fractional intercepts which the plane makes with crystallographic axes.

b) Diffraction occurs only when Bragg's Law is satisfied condition for constructive interference of two X-rays, from planes with spacing d.

Which of the above statements are correct?

A) Both a & b
B) Only a
C) Only b
D) None of the above

85. The plastic response (deformation) of a materials to compressive force is known as:

A) Malleability
B) Ductile material
C) Plastic material
D) Elastic material

86. The following statements describe properties of bioceramics-

a) Differences in the microstructures of the five categories of bioceramicsare primarily a result of the different thermal processing steps required to produce them.

b) The relative rate of densification during liquid-state sintering is slower than that of solid-phase sintering

Which of the above statements are correct?

A) Both a & b
B) Only a
C) Only b
D) None of the above

87. Superelasticity (or pseudoelasticity) refers to the ability of Nikel-Titanium alloy (NiTi) to return to its original shape upon unloading after substantial deformation. The following statements describe the phenomenon-

a) This is based on stress induced martensite formation.

b) When the stress is released, the martensite transforms back into austenite, and the specimen returns back to its original shape.

Which of the above statements are correct?

A) Both a & b
B) Only a
C) Only b
D) None of the above

88. Following condition represents onset of necking:

A) $\varepsilon u = n$
B) $\varepsilon u = 1+n$
C) $\varepsilon u = 1-n$
D) $\varepsilon u = \ln (1+n)$

89. According to distortion-energy criterion, yielding occurs when:

A) Distortion energy reaches a critical value
B) Second invariant of the stress deviator exceeded some critical value
C) Octahedral shear stress reaches a critical value
D) All of the above

90. Period in gait when both lower extremities are in contact with walking surface in reference limb:

A) Cadence
B) Step length
C) Double stance
D) Stride length

91. During normal gait, the center of gravity oscillates vertically approx. How many inches?

A) 2
B) 4
C) 8
D) The center of gravity remains constant during normal gait

92. Which of the following is the correct sequential order of the phases of healing?

A) Remodelling, inflammation, hemostasis, and repair
B) Inflammation, hemostasis, proliferation, and maturation
C) Hemostasis, inflammation, repair, and remodelling
D) Inflammation, maturation, proliferation, and hemostasis

93. The following statements describe events during wound healing process-

a) M1 to M2 macrophage phenotype change occurs in accordance with the change from inflammation to repair stage
b) During Fibroplasia, fibroblast profibrotic phenotype is completely replaced by a migratory phenotype

Which of the above statements are correct?

A) Both a & b
B) Only a
C) Only b
D) None of the above

94. The following statements relates to bicarbonate buffer system-

a) Carbon dioxide in the gas phase dissolves in the medium, establishes equilibrium with HCO^- ions, and increases the pH
b) Atmospheric CO_2 tension will regulate the concentration of dissolved CO_2 directly, as a function of time
c) This regulation in turn produces H_2CO_3

Which of the above statements are correct?

A) All of the above
B) B and C
C) Only A
D) Only B

95. Cell storage techniques reduces the following and helps in preserving the cells-

a) Genotypic drift due to genetic stability.

b) Senescence and the resultant extinction of the cell line.

c) Stabilization of growth characteristics and acquisition of malignancy-associated properties.

d) Phenotypic instability due to selection and dedifferentiation.

Which of the above statements are correct?

A) All of the above

B) b and d

C) a and c

D) a and b

96. Which is the most commonly used cryopreservative for freezing cells

A) Glycerol

B) Dimethyl sulfoxide (DMSO)

C) Polyvinylpyrrolidone (PVP)

D) Polyethylene glycol (PEG)

97. Telomerase is composed of three principal subunits, an RNA component (hTR), a protein catalytic subunit (hTERT), and dyskerin (DKC1). Very recently a holoenzyme subunit, TCAB1 (Telomerase Cajal body protein 1). Which of the following are used to induce immortalization in the cell lines-

A) hTR and DKC1

B) Only DKC1

C) TCAB1 and hTERT

D) hTERT only

98. Consider the following statements when neoplastic transformation takes place in cultured cells-

a) Loss of cell–cell recognition

b) Disorganized growthpattern

c) Loss of contact inhibition

d) Cells can grow detached from the substrate, in suspension culture

Which of the above statements are correct?

A) All of the above

B) b and d

C) a and c

D) a and b

99. Detection of mycoplasma infections is not obvious byroutine microscopy, other than through signs of deteriorationin the cell culture. Following are some available techniques-

a) Fluorescent staining of DNA
b) Polymerase chain reaction
c) Chromatography
d) Autoradiography

Which of the above specialized techniques can be used for detection of mycoplasma contamination-

A) b, c, and d
B) All of the above
C) a, b and d
D) c and d

100. Optimal freezing of cells for maximum viable recovery on thawing depends on minimizing intracellular ice crystalformation and reducing cryogenic damage from foci of highconcentrationsolutes formed when intracellularwater freezes. This is achieved by-

a) By freezing slowly
b) By using a hydrophilic cryoprotectant
c) By storing the cells at the lowest possible temperature
d) By thawing slowly

Which of the above statements are correct?

A) All of the above
B) b, c and d
C) a and c
D) a, b and c

101. Cell- extracellular matrix interactions play a vital role in developmental process. The following processes are involved in tissue development-

a) Adhesion and migration
b) Proliferation
c) Differentiation
d) Apoptosis

Which of the above are regulated by c ell-matrix interactions-

A) All of the above
B) b, c and d
C) a and c
D) a, b and c

102. Various signalling pathways are involved during healing and regenerative process. Following are some signalling pathways-

a) FAK/Src
b) MAP/JNK

Which of the above pathways are involved in healing?

A) Only a
B) Only b
C) Both a & b
D) None of the above

103. Cell surface receptors other than syndecans and integrins can also promote cell migration. Following are some common cell surface receptors-

a) Hyaluronan-binding receptors
b) CD44
c) Toll like receptors
d) Insulin receptor

Which of the above promote cell migration-

A) All of the above
B) b, c and d
C) a and c
D) a, b and c

104. Foreign Body Response (FBR) involves the following steps-

a) Fibroblast & Endothelial cell recruitment
b) Inflammatory cell recruitment
c) Foreign body giant cells (FBGC) formation
d) Protein adsorption
e) Fibrous capsule formation

Which is the correct sequence of events during FBR-

A) d-b-a-c-e
B) a-b-c-d-e
C) e-d-c-a-d
D) c-e-b-a-d

105. Scars formed under excessive external tension may have increased fibrosis through feedback loops between mechanical cues and matrix stiffening. Following factors regulate matrix stiffening-

a) Cellularity
b) Vascularity
c) Inflammation
d) Myofibroblast transformation

Which of the above are increased during excessive external tension-

A) b, c and d
B) a and c
C) a, b and c
D) All of the above

106. Connective tissues are exposed to the various mechanical stimuli. Some physiological mechanical stimuli are listed below-

a) Cyclic strain
b) Interstitial flow
c) Compression
d) Shear flow

Which of the above are not experienced by connective tissues-

A) b, c and d
B) Only d
C) a, b and c
D) All of the above

107. Which of the following cell organelles are not present in procaryotic cells-

A) Plasma membrane
B) Ribosomes
C) Cell wall
D) Nucleus

108. Which of the following are not present in a eukaryotic cell's nucleus-

A) Nuclear membrane
B) Chromatin
C) Nucleoid
D) Nuclear pores

109. The enzymes present in pancreatic juice are:

A) Amylase, Trypsinogen, Peptidase, Rennin
B) Peptidase, Pepsin, Amylase, Rennin
C) Maltase, Amylase, Trypsinogen, Pepsin
D) Trypsinogen, Lipase, Amylase, Procarbo-xypeptidase

110. Which of the following hormones stimulates the production of pancreatic juice and bicarbonate?

A) Cholecystokinin and secretin
B) Angiotensin and epinephrine
C) Insulin and glucagon
D) Gastrin and insulin

111. Which of the following is synthesized and stored in the liver cells?

A) Lactose
B) Arabinose
C) Glycogen
D) Galactose

112. Which of the following is correct for the partial pressure of oxygen in alveoli?

A) Less than the blood
B) Less than carbon dioxide
C) Equal to that of the blood
D) More than the blood

113. RBCs present in the blood of a person residing at higher altitudes-

A) Increase in the number
B) Increase in size
C) Decrease in size
D) Decrease in the number

114. Most of the carbon dioxide produced in the tissues is transported to the lungs as-

A) Attached to haemoglobin
B) Carbonates
C) Dissolved in the blood
D) Bicarbonates

115. Which of the following is one of the parts of the hindbrain?

A) Corpus callosum
B) Hypothalamus
C) Cerebellum
D) Spinal cord

116. If there is an injury in the hypothalamus region of the brain, it is most likely to affect-

A) Short-term memory
B) Regulation of body temperature
C) Decision making
D) Co-ordination during locomotion

117. Afferent neurons carry nerve impulses from-

A) Receptors to CNS
B) Central nervous system (CNS) to muscles
C) Effector organs to CNS
D) CNS to receptors

118. The seminiferous tubules of the testis are lined by the germinal epithelium consisting of-

A) Spermatogonium
B) Spermatids
C) Spermatocytes
D) Cells of Sertoli

119. There is a connective tissue cord extending between the testis and abdominal wall knownas-

A) Gubernaculum
B) Mesenteric cord
C) Spermatic cord
D) Testis cord

120. After ovulation, the Graafian follicle becomes an endocrine organ called-

A) Ovarian tube
B) Fibrin
C) Corpus luteum
D) Globulin

ROUGH WORK

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

Booklet Serial No. 208645

Test Booklet Series

TEST BOOKLET
ASSISTANT PROFESSOR
CIVIL ENGINEERING
Written Test - 2023
(06)

A

Time Allowed: Two Hours ***Maximum Marks: 120***

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET *DOES NOT* HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT* write *anything else*** on the Test Booklet.
4. This Test booklet contains **120** items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer /Response Sheet provided. *See directions in the Response Sheet.*
6. *All* items carry equal marks.
7. Before you proceed to mark in the Answer /Response Sheet, the response to various items in the Test Booklet, you have to fill in some particulars in the Answer /Response Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer /Response Sheet***. You are permitted to take away with you the Test Booklet and ***Candidate's Copy of the Response Sheet***.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. While writing Centre, Subject and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN"**.
11. **Penalty for wrong answers:**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).

    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **(0.25)** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

1. Maximum Shear Stress Theory is also known as:

   A) Von Mises Theory

   B) Guest's theory

   C) St. Venant's Theory

   D) Rankine Theory

2. Principal stresses at a point are 80 N/mm^2 and 40 N/mm^2, both tensile. The yield stress in simple tension for this material is 200 N/mm^2. The values of factors of safety according to maximum principal stress theory and maximum shear stress theory, respectively, are

   A) 2.5 and 2.5

   B) 2.5 and 5.5

   C) 5.5 and 1.67

   D) 5 and 5

3. What is the shear stress at the neutral axis in a beam isosceles triangular section with a base of 40 mm and height 20 mm subjected to a shear force of 3 kN?

   A) 3 MPa

   B) 6 MPa

   C) 10 MPa

   D) 20 MPa

4. A 100 mm diameter solid shaft in a small hydraulic turbine is subjected to an axial compressive load of 100 π kN and a torque of 5 π kNm. The maximum shear stress that can be induced in the shaft is

   A) $20\sqrt{3}$ N/mm^2

   B) $20\sqrt{8}$ N/mm^2

   C) $20\sqrt{15}$ N/mm^2

   D) $20\sqrt{17}$ N/mm^2

5. A solid shaft A of diameter D and length L is subjected to a torque T; another shaft B of the same material and of the same length, but half the diameter, is also subjected to the same torque T. the ratio between the angles of twist of shaft B to that of shaft A is

A) 32 B) 16

C) 4 D) 8

6. The buckling load for a given material depends upon:

A) slenderness ratio and modulus of elasticity

B) Poisson's ratio and modulus of elasticity

C) Poisson's ratio and slenderness ratio

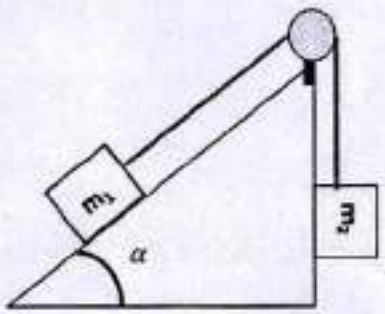
D) Slenderness ratio and cross-sectional area

7. The hoop stress induced in a thick cylinder due to internal pressure will be

A) Tensile B) Compressive

C) Shear D) Torsional stress

8. In the Fig., if the mass m_1 is placed on an inclined rough plane having coefficient of friction μ, then the tension in the string will be



A) $\frac{m_1 m_2 . g(1+\sin\alpha+\mu\cos\alpha)}{m_1+m_2}$ B) $\frac{m_1 m_2 . g(1+\sin\alpha-\mu\cos\alpha)}{m_1+m_2}$

C) $\frac{m_1 m_2 . g(1+\mu\cos\alpha)}{m_1+m_2}$ D) $\frac{m_1 m_2 . g(1-\mu\cos\alpha)}{m_1+m_2}$

9. A circular three-pinned arch with a span of 40 meters and an elevation of 8 meters is hinged at the crown and springing. On the left side, it carries a horizontal load of 100 kN per vertical meter. At the right springing, the horizontal thrust will be

A) 600 kN

B) 400 kN

C) 200 kN

D) 100 kN

10. The moment of inertia of a thin spherical shell of mass m radius r about its diameter is

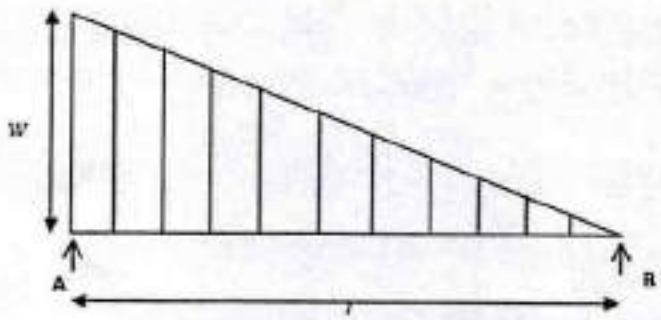
A) $mr^2/3$

B) $2mr^2/3$

C) $2mr^2/5$

D) $3mr^2/5$

11. A simply supported beam with a gradually varying load from zero to W per unit length at A is shown in Fig. below. The maximum bending moment for the beam is:



A) $(wl^2)/(3\sqrt{3})$

B) $(wl^2)/(6\sqrt{3})$

C) $(wl^2)/(9\sqrt{3})$

D) $(wl^2)/(12\sqrt{3})$

12. A two span continuous beam is having equal spans each of length L each subjected to a uniformly distributed load w per unit length. The beam has constant flexural rigidity, than the reaction at the middle support is

A) wL

B) 5 wL/2

C) 5 wL/4

D) 5 wL/8

13. Determine the static indeterminacy of the beam shown in Fig. Below :

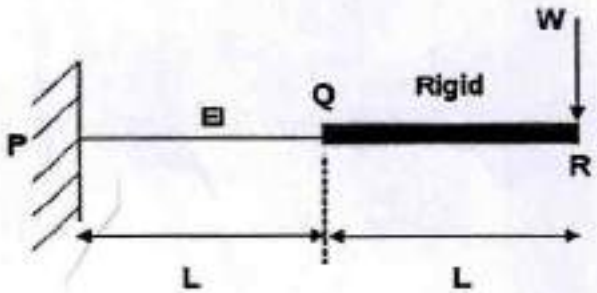
A) 2

B) 1

C) 3

D) 4

14. In the cantilever beam PQR shown in figure below, the segment PQ has flexural rigidity EI and the segment QR has infinite flexural rigidity. The deflection and slope of the beam at Q are respectively.



A) (5WL^3)/6EI and (3WL^2)/2EI

B) (WL^3)/3EI and (WL^2)/2EI

C) (WL^3)/2EI and (WL^2)/EI

D) (WL^3)/3EI and (3WL^3)/2EI

15. A beam fixed at the ends and subjected to lateral loads only is statically indeterminate and the degree of indeterminacy is

A) One

B) Two

C) Three

D) Four

16. A concrete mix is to be designed for a strength of 25 MPa. If 5% of samples are having cube strength below 25 MPa by more than 5 MPa, and the standard deviation of the samples is 5 MPa. Determine the target mean strength?

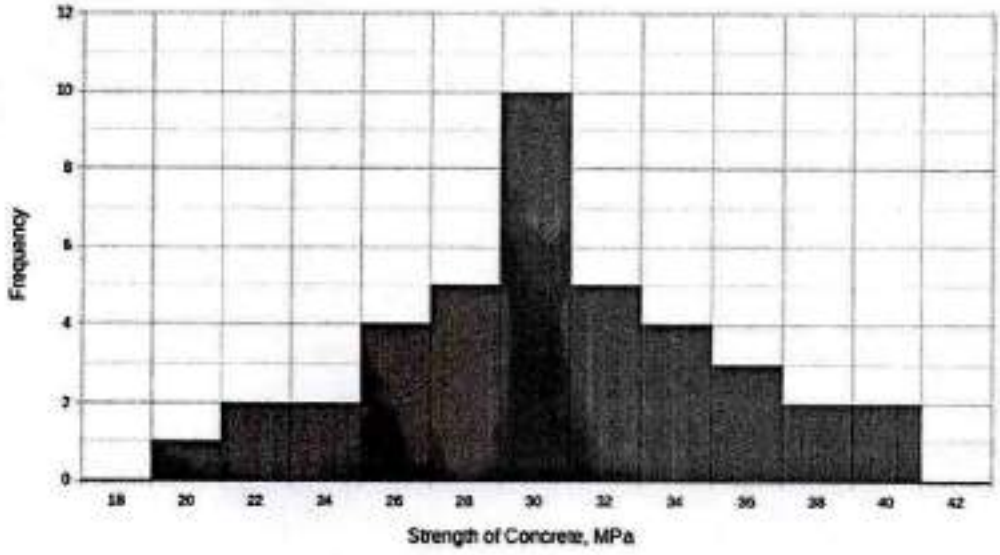
A) 11.75 MPa

B) 28.25 MPa

C) 33.25 MPa

D) 16.75 MPa

17. The cube strength results for 40 cubes of concrete produced at the site building project are shown in the histogram below:



Determine the probability that the strength is less than 25 MPa?

A) 0.15

B) 0.13

C) 0.125

D) 0.2

18. What is the limiting percentage of tensile steel in a rectangular section having grade of concrete as M25 and characteristic strength of steel (σ_y) as 550 N/mm^2 ?

A) 2.2

B) 1.19

C) 0.94

D) 0.83

19. Which of the following statements is true for the design of a RCC section according to limit state of collapse:

i) The maximum strain in concrete at the outermost compression fiber is taken as 0.35% in bending regardless of strength of concrete.

ii) The relationship between stress-strain in concrete is assumed to be parabolic with maximum stress equal to 0.446 σ_{ck} ?

A) Only i

B) Only ii

C) Both i and ii

D) Neither i nor ii

20. A floor slab of thickness, t, is cast monolithically transverse to a rectangular continuous beam of span L, and width, B. If the distance between two consecutive points of contraflexure is, L_o , the effective width of compression flange at a continuous support is

A) B

B) L/3

C) B+12t

D) B+6t+L_o/6

21. In shear design of an RC beam, other than allowable shear strength of concrete (τ _c), there is also an addition check suggested in IS 456:2000 with respect to the maximum permissible shear stress (τ _cmax). The check τ _cmax is required to take care of

A) Additional shear resistance from reinforcing steel

B) Additional shear stress that comes from accidental loading

C) Possibility of failure of concrete by diagonal tension

D) Possibility of crushing of concrete by diagonal compression.

22. A column of size 450 mm × 600 mm has unsupported length of 3.0 m and is braced against side sway in both directions. According to IS 456:2000, the minimum eccentricities (in mm) with respect to major and minor principal axes are

A) 20 and 20

B) 26 and 21

C) 26 and 20

D) 21 and 15

23. As per IS 3370 (part2), the permissible compressive stress in steel reinforcement for a column subjected to direct load in case of high strength deformed bar

A) 115 MPa

B) 140 MPa

C) 130 MPa

D) 125 MPa

24. In post-tensioned pre-stressed concrete beam, the end block zone is the zone between the end of the beam and the section where:

A) Placed at the center of cross-section over the entire span.

B) Placed at some eccentricity over the entire span.

C) Varying linearly from the center of cross-section at the ends to maximum eccentricity at the middle section.

D) Parabolic with zero eccentricity at the ends and maximum eccentricity at the center of the span

25. The percentage loss of prestress due to anchorage slip of 5 mm in a concrete beam of length 30 m which is post-tensioned by a tendon with an initial stress of 1000 N/mm^2 and modulus of elasticity equal to 2.1 ×10^5 N/mm^2 is

A) 3%

B) 4%

C) 3.5%

D) 7%

26. A structural member carrying a pull of 700 kN us connected to a gusset plate using rivets. If the pulls required to shear the rivets, to crush the rivets and to tear the plate per pitch length are respectively 60 kN, 35 kN and 70 kN, then the number of rivets required will be:

A) 12

B) 18

C) 20

D) 22

27. The effective throat thickness in case of incomplete penetration butt weld is taken as

A) 7/8th of the thickness of the thicker part jointed

B) 7/8th of the thickness of the thinner part jointed

C) 5/7th of the thickness of the thicker part jointed

D) 5/7th of the thickness of the thinner part jointed

28. According to Indian standards, if the angle between fusion faces of a fillet weld is 60° - 90°, the effective throat thickness is equal to

A) $1/\sqrt{2}$. size of the weld

B) $1/\sqrt{3}$. size of the weld

C) $\sqrt{2}$. size of the weld

D) $\sqrt{3}$. size of the weld

29. The slenderness ratio of a single strut should be less than

A) 180

B) 250

C) 300

D) 350

30. The effective length of a structural steel compression member of length L effectively held in position and restrained against rotation at one end but neither held in position not restrained against rotation at the other end, is

A) L

B) 1.2 L

C) 1.5 L

D) 2 L

31. Which of the following statements are true regarding relationship of viscosity with temperature?

1. Viscosity of liquids decrease with the increase in temperature
2. Viscosity of gases increases with increase in temperature
3. Viscosity of liquids increases with the increase in temperature
4. Viscosity of gases increases with decrease in temperature

A) 1 and 2

B) 2 and 4

C) 1 only

D) 2 only

32. What is the shear stress at the surface of a flat plate when an oil with a dynamic viscosity of 0.4 N-s/m² flows over it? The equation describes the velocity distribution of the flow: $u = (4/3)y^2 + 6y - 9$, where "y" represents the vertical distance from the plate surface

A) -3.6 N/m²

B) 0 N/m²

C) 2.4 N/m²

D) -9 N/m²

33. Determine the surface tension acting on a soap bubble with a diameter of 72 mm, given that the bubble exhibits an excess pressure of 100 N/m²?

A) 0.18 N/m

B) 0.72 N/m

C) 0.9 N/m

D) 0.36 N/m

34. Consider a metal gate measuring (6*6) m, which is restraining an oil with a relative density of 0.9 on one side, with the oil's free surface at the top. Calculate the moment of the force exerted by the oil with respect to the bottom edge of the gate (where "z" represents the specific weight of water):

A) 216 z

B) 194.4 z

C) 72 z

D) 36 z

35. The value of momentum correction factor for laminar flow through a circular pipe is:

A) 4/3

B) 2

C) 3/4

D) 1

36. **Assertion:** An ideal fluid is incompressible and non-viscous in nature.

Reasoning: Ideal fluid is only an imaginary fluid as all the fluids which exist have some viscosity.

A) Both A and R are true and R is the correct explanation of A.

B) Both A and R are true but R is not the correct explanation of A.

C) A is true but R is false.

D) A is false but R is true.

37. While solving a dimensional similarity problem based on free surface flow over a spillway then what will be the value of scale ratio for acceleration? (Where L_r is length scale ratio)

A) $L_r^{\frac{1}{2}}$

B) 1

C) $L_r^{\frac{3}{2}}$

D) $L_r^{\frac{1}{3}}$

38. In the case where the angle of contact of a liquid drop is acute then:

A) Cohesion is equal to adhesion

B) Cohesion is more than adhesion

C) Adhesion is more than cohesion

D) There is no relationship with cohesion and adhesion

39. Which one of the following conditions explains the stable equilibrium condition in case of a floating body?

A) When center of buoyancy is above center of gravity

B) When metacenter is below center of gravity

C) When center of buoyancy coincide with center of gravity

D) When metacenter is above center of gravity

40. The specific energy of a 15m wide channel is to be 3 kg-m/kg. Determine the depth of flow when the discharge us maximum for the given specific energy?

A) 5m

B) 2m

C) 1.5m

D) 1m

41. Which of the statements below are correct concerning the Reynolds number in the case of a circular pipe:

1. Flow is laminar if $R_e < 2000$
2. Flow is laminar if $R_e < 500$
3. Flow is turbulent if $R_e > 4000$
4. Flow is turbulent if $R_e > 2000$

A) 1 and 3

B) 2 and 4

C) 1 and 4

D) 2 and 3

42. Consider a main pipe carrying water between two reservoirs which divides into two parallel branch pipes A and B. Diameter of pipe A is twice than that of pipe B. Calculate the ratio of discharge obtained from pipe A than that of pipe B?

A) 4

B) 5.65

C) 6.39

D) 3

43. The perpendicular distance by which the boundary of a solid body should be shifted to compensate for reduction in flow rate on account of boundary layer formation is known as:

A) Momentum Thickness

B) Displacement Thickness

C) Energy Thickness

D) Discharge Thickness

44. Given a geometrically similar model of a spillway with a length scale ratio of 1/16, if the discharge in the prototype is measured to be 10240 m^3/sec, what is the corresponding discharge in the model of the spillway?

A) 10 m^3/s

B) 640 m^3/s

C) 40 m^3/s

D) 2.5 m^3/s

45. The equation explaining the velocity potential function for a fluid flow is given as $18x^2 + 4y^2$, calculate the value of velocity at (1,0):

A) 4 units

B) 8 units

C) 18 units

D) 36 units

46. Which one of the following statements is **NOT** correct?

A) When the water content of soil lies between its liquid limit and plastic limit, the soil is said to be in plastic state.

B) Boussinesq's theory is used for the analysis of stratified soil.

C) The inclination of stable slope in cohesive soil can be greater than its angle of internal friction.

D) For saturated dense fine sand after applying overburden correction, if the standard penetration test value exceeds 15, dilatancy correction is to be applied.

47. If soil is dried beyond its shrinkage limit, it will show

A) Large volume change

B) Moderate volume change

C) Low volume change

D) No volume change

48. A fine grained soil has 60% (by weight) silt content. The soil behaves as semi-solid when water content is between 15% and 28%. The soil behaves fluid-like when the water content is more than 40%. The 'Activity' of the soil is

A) 3.33

B) 1.5

C) 2.8

D) 0.3

49. A masonry dam is founded on pervious sand having porosity equal to 50% and specific gravity of sand particles to 2.50. For a desired factor of safety of 3 against sand boiling, the maximum permissible upward gradient will be

A) 2.5

B) 4

C) 0.25

D) 1.25

50. Root time method is used to determine

A) T, time factor

B) C_v, coefficient of consolidation

C) a_v, coefficient of compressibility

D) m_v, coefficient of vol. compressibility

51. Sand drain are used to

A) Reduce the settlement

B) Transfer the load

C) Increase the permeability

D) Accelerate the consolidation

52. A soil sample is subjected to a hydrostatic pressure σ The Mohr circle for any point in the soil sample would be

A) A circle of radius σ and centre at the origin

B) A circle of radius σ and centre at a distance σ from the origin

C) A point at a distance σ from the origin

D) A circle of diameter σ and centre at the origin

53. The undrained cohesion of a remoulded clay soil is 10 kN/m^3. If the sensitivity of the clay soil is 20, the corresponding remoulded compressive strength is

A) 5 kN/m^3

B) 10 kN/m^3

C) 200 kN/m^3

D) 20 kN/m^3

54. The plate load test was conducted on a clayey strata by using a plate of 0.3*0.3 m dimensions, and the ultimate load per unit area for the plate was found to be 195 kPa. The ultimate bearing capacity (in kPa) of a 2m wide square footing would be

A) 27

B) 30

C) 195

D) 180

55. Four columns of a building are to be located within a plot size of 10 m*10m. The expected load on each column is 4000 kN. Allowable bearing capacity of soil deposit is 100 kN/m^2. The type of foundation best suited is

A) Isolated footing
B) Raft foundation
C) Combined footing
D) Pile foundation

56. A core cutter of 130 mm height has inner and outer diameters of 100 mm and 105 mm, respectively. The area ratio of the core cutter is

A) 10.25
B) 10.75
C) 10.5
D) 13

57. A 0.5*0.5 m square concrete pile is to be driven in a homogenous clayey soil having undrained shear strength C_u = 50kPa and unit weight, γ = 18.0 kN/m^3. The design capacity of the pile is 600 kN. The adhesion factor α is given as 0.75. The length of the pile required for the above design load with a factor of safety of 2.0 is

A) 14.5 m
B) 12.5 m
C) 11.8 m
D) 16 m

58. Contact pressure for a rigid footing resting on clay at the centre and the edge are respectively

A) Maximum and zero
B) Minimum and maximum
C) Zero and maximum
D) Maximum and maximum

59. A strip footing is resting on the ground surface of a pure clay bed having an undrained cohesion C_u. The ultimate bearing capacity of the footing is equal to

A) $2\pi C_u$
B) $(\pi + 2) C_u$
C) πC_u
D) $(\pi + 3) C_u$

60. Surcharge loading required to be placed on the horizontal backfill of a smooth retaining vertical wall so as to completely eliminate tensile crack is

A) $2c$

B) $2c - K_a$

C) $2c / (K_a)^{0.5}$

D) $2c / K_a$

61. For one cubic meter of brick masonry, the number of bricks required are

A) 400

B) 450

C) 500

D) 550

62. The shrinkage of concrete

A) Is proportional to contents of cement

B) Is directly proportional to water content at the time of mixing

C) Increases with the increase in the percentage of concrete

D) All of the above

63. The rapid hardening Portland cement is obtained by

A) Grinding the clinker to a high degree of fineness

B) Adding calcium sulphate to the mixture

C) Adding gypsum after grinding

D) Burning the mixture at a lower temperature

64. The addition of pozzolona to Portland cement causes

A) Less heat of hydration

B) Increase in shrinkage

C) Decrease in permeability

D) All of the above

65. The compressive strength of a good Portland cement and standard sand mortar after 3 days of curing should not be less than

A) 7 MN/m^2

B) 11.5 MN/m^2

C) 17.5 MN/m^2

D) 21 MN/m^2

66. Partial or complete elimination of formwork is possible in the construction by using

A) Ferro-cement

B) Alumina cement

C) Rapid hardening cement

D) Air entrained cement

67. Polymer concrete is most suitable for

A) Sewage disposal works

B) Road repair works

C) Mass concreting works

D) Insulating exterior walls of an air-conditioned building

68. Which of the following is/are the property(s) of good quality stones?

1. Crushing strength greater than 1000 kg/cm^2
2. Specific gravity should be greater than 2.7
3. A stone is rejected if it absorbs water more than 20%

A) 2 and 3

B) Only 1

C) 1, 2 and 3

D) 1 and 2

69. The wood preservative "creosote" is derived from:

A) Wood or coal

B) Pentachlorophenol

C) Chromated zinc chloride

D) Acidic cupric chromate

70. In measurement of Plastering activity, No deduction is made for small opening up to _____ and at the same time, no additions are made for jambs, soffits and of the sills of these opening.

A) 0.1 sqm

B) 0.5 sqm

C) 10 sqm

D) 0.001 sqm

71. What is the correct sequence of preparing an estimate?

1. Detailed estimate
2. Approximate estimate
3. Supplementary estimate
4. Revised estimate

A) 1, 2, 3, 4

B) 4, 3, 1, 2

C) 2, 1, 3, 4

D) 1, 3, 2, 4

72. The scrap value of a building may be about _____ percentage of the total cost of construction.

A) 7%

B) 10%

C) 5%

D) 12%

73. The activity which is crashed first has

A) Least cost slope

B) Highest cost slope

C) Crashing has no relation with cost slope

D) None of these

74. Slack time in PERT analysis

A) Can never be greater than

B) Is always zero for critical activities

C) Can never be less than zero

D) Is minimum for critical events

75. The optimistic, most likely, and expected completion time of an activity are 5 days, 10 days, and 21 days respectively. What are the expected time and standard deviation?

A) 12, 3

B) 11, 4

C) 11, 2.67

D) 12, 16

76. The type of surveying in which the curvature of the earth is taken into account is called

A) Plane surveying

B) Geodetic Surveying

C) Preliminary surveying

D) None of the above

77. The reduced bearing of a 15m long line is N30°E. The departure of the line is

A) 7.5

B) 8.5

C) 10.5

D) 15

78. An observer standing on the deck of a ship just sees the top of a lighthouse. The top of the lighthouse is 36m above the sea level and the height of the observer's eye is 4m above the sea level. The distance (in km.) of the observer from the lighthouse is

A) 40

B) 31

C) 36

D) 28

79. Camber on highway pavement is provided to take care of

A) Off-tracking

B) Sight distance

C) Centrifugal force

D) Drainage

80. Width of carriage way for a two lane with no kerbs is recommended to be

A) 3.5 m

B) 7 m

C) 7.5 m

D) 5.5 m

81. As per IRC: 67-2001, a traffic sign indicating the speed limit on a road should be of

A) Circular shape with white background and red border

B) Triangular shape with white background and red border

C) Triangular shape with red background and white border

D) Circular shape with red background and white border

82. A linear relationship is observed between speed and density on a certain section of a highway. The free flow speed is observed to be 60km/h and the jam density is estimated as 90 vehicle/km length. Based on the above relationship, the maximum flow expected on this section and the speed at the maximum flow will respectively be

A) 8000 vehicle/h and 80km/h

B) 1350 vehicle/km and 60 km/h

C) 90 vehicle/km and 60 km/h

D) 1350 vehicle/km and 30 km/h

83. The initial concavity in the load-penetration curve of a CBR test is NOT due to

A) Uneven top surface

B) High impact at start of loading

C) Inclined penetration plunger

D) Soft layer of soaked soil

84. As per IS specification, every metre length of the chain should individually be accurate to within ± 2mm when measured under a tension of

A) 50 Newton

B) 60 Newton

C) 70 Newton

D) 80 Newton

85. In the context of flexible pavement design, the ratio of contact pressure to tyre pressure is called the rigidity factor. This factor is less than unity when the tyre pressure is

A) Equal to 0.7 N/mm^2

B) Equal to 0.5 N/mm^2

C) More than 0.7 N/mm^2

D) Less than 0.65 N/mm^2

86. The standard plate size in a plate bearing test for finding modulus of subgrade reaction (k) value is

A) 25 cm diameter

B) 50 cm diameter

C) 65 cm diameter

D) 75 cm diameter

87. For a 13m rail length of BG track, having a sleeper density (n+6), the total number of sleepers required per km will be nearly

A) 1450

B) 1463

C) 1480

D) 1490

88. A level instrument at a height of 1.220 m has been placed at a station having a reduced level (RL) of 111.565m. The instrument reads 1.835 m on a levelling staff held at the bottom of a bridge deck. The RL (in m) of the bottom of the bridge deck is

A) 112.785

B) 110.95

C) 114.62

D) 112.18

89. If the distance between the instrument station and the staff station is 1 km, the correction for refraction in 'm' is

A) 0.0673

B) 0.0785

C) 0.0121

D) 0.0112

90. The superelevation needed for a vehicle travelling at a speed of 60 kmph on a curve of radius 128 m on a surface with a coefficient of friction 0.15 is

A) 0.71

B) 0.15

C) 0.07

D) 0.22

91. Out of the chemicals listed below which chemical is most suitable for reducing evaporation when applied to water surface

A) Methyl alcohol

B) Stearyl alcohol

C) Cetyl alcohol

D) Both (B) and (C)

92. The area between the isohyets 40 cm and 55 cm is 100 square km and between 55 cm and 70 cm is 120 square km. The average depth of annual precipitation over the above basin of 220 square km will be

A) 55.68

B) 54.28

C) 58.12

D) 54.12

93. The rainfall on five successive days were measured as 120 mm, 60 mm, 60 mm, 40 mm and 20 mm respectively. If the infiltration index for the catchment area is earlier estimated as 50 mm/day, the total surface run off will be

A) 50 mm
B) 90 mm
C) 80 mm
D) 60 mm

94. Probability (P) and Recurrence interval (T) follow which of the following equations

A) $P/T = 1$
B) $P/T^2 = 1$
C) $PT = 1$
D) $PT^2 = 1$

95. The alignment of repelling groyne can be best described as

A) Perpendicular to bank
B) Parallel to bank
C) Pointing downstream
D) Pointing upstream

96. In states like Punjab and Haryana where climatic conditions are dry, excessive irrigation may lead to the deposition of salt on the top layer of the soil. In such cases, which mineral would you most advise the farmers to add to solve the problem of salinity in the soil?

A) Corundum
B) Calcite
C) Gypsum
D) A mixture of Corundum and Calcite

97. Which of the following relationship holds true between Absolute humidity in air and altitude

A) Absolute humidity decreases at higher altitudes
B) Absolute humidity increases at higher altitudes
C) Absolute humidity remains constant at all altitudes
D) None of these

98. For peak flood estimates which of the following is a possible value of the constant C in Dicken's formula $Q = CA^{3/4}$ when using for a hilly catchment

A) 5
B) 7
C) 9
D) 15

99. Bernard's distribution graph is a plot which has time on X-axis and Y- axis represents the

A) Percentage of total surface run off during uniform time intervals

B) Run off and Infiltration capacity

C) Rainfall intensity

D) Peak discharge

100. Which method gives most accurate estimate of average rainfall for any kind of catchment without any prerequisites?

A) Isohyetal method

B) Normal ratio method

C) Theissen polygon method

D) Arithmetic mean method

101. The canal, which cannot irrigate on both sides and therefore irrigates only on one side is called

A) Watershed canal

B) Contour canal

C) Side slope canal

D) Ridge canal

102. The optimum kor water depth for a kharif crop is 17 cm with an allowed kor water period of 5 weeks, the outlet discharge factor for this crop will be:

A) 1200.44 ha/cumec

B) 1568.55 ha/cumec

C) 1778.82 ha/cumec

D) 1984.16 ha/cumec

103. Duty on capacity is referred as

A) Full Supply Coefficient

B) Outlet duty

C) Capacity factor

D) Quantity duty

104. Which of the following options best describes Denehey's spur

A) A T-shaped earthen spur used in India

B) A type of a balli spur, especially developed for Indian rivers

C) A hockey-shaped earthen spur

D) None of the above

105. A hydraulic jump usually occurs when

A) Flow velocity is very high

B) Flow changes from a supercritical flow to a sub-critical flow.

C) Flow changes from a sub-critical flow to a supercritical flow.

D) None of the above

106. The maximum flow occurs in an egg-shaped sewer when the ratio of flow depth to vertical diameter is

A) 1.0 B) 0.95

C) 0.5 D) 0.33

107. Septic tank is a

i) settling tank

ii) digestion sludge treatment

iii) aeration tank

iv) watertight tank

The correct answer is

A) (i) and (ii) B) (ii) and (iii)

C) (i) and (iv) D) (ii) and (iv)

108. What is the fire demand of the city of One lakh population by Buston's formula?

A) 31820 B) 41733

C) 13632 D) 56630

109. Match List-I with List -II

List-I	**List -II**
a. Soil pipe	1. Preserves the water seal of traps through access to atmospheric air
b. Waste pipe	2. Carries liquid waste including human excreta
c. Anti siphonage pipe	3. Carries liquid waste that do not contain human excreta
d. Vent pipe	4. Carries wastewater
	5. Provides flow of air to or from a drainage system in order to prevent vacuum pressure and excessive pressure and provides escape for foul gas

A) a-3 b-4 c-5 d-1 B) a-2 b-3 c-1 d-5

C) a-3 b-2 c-1 d-5 D) a-4 b-3 c-2 d-5

110. Sewage treatment units are designed for

A) Maximum flow only
B) Minimum flow only
C) Average flow only
D) Maximum and minimum flow

111. An industrial wastewater enters a stream having a BOD concentration of 10 mg/L and a flow of 20 m^3/s. If the BOD concentration of wastewater is 250 mg/L and then the BOD concentration in the stream at a point downstream of the point of confluence of wastewater with the stream is 26.74 mg/L. Then the flow of wastewater will be

A) 15 m^3/s
B) 2.5 m^3/s
C) 25 m^3/s
D) 1.5 m^3/s

112. Consider the following statements:

Activated sludge process can be said to comprise:

1. Conversion of dissolved organic matter into biological floes
2. Removal of dissolved BOD of the waste water
3. Digestion of the sludge

Which of these statements are correct?

A) 1, 2 and 3
B) 1 and 2 only
C) 2 and 3 only
D) 1 and 3 only

113. What is the correct sequence of formation of the following compounds during chlorination of water in which ammonia is present?

1. NCl_3
2. NH_2Cl
3. $NHCl_2$

Select the correct answer using the codes given below:

A) 1, 2, 3
B) 2, 1, 3
C) 3, 1, 2
D) 2, 3, 1

114. Match the following

	List - I (Environmental effect)		**List - II (Air pollutant)**
a)	Recirculation	1.	Seeding
b)	Aerobic action	2.	Biofilters
c)	Sludge disposal	3.	Lagging
d)	Sludge digestion	4.	Contact bed

A) a-2 b-3 c-1 d-4
B) a-4 b-2 c-3 d-1
C) a-4 b-1 c-2 d-3
D) a-3 b-2 c-1 d-4

115. **Assertion (A)** : Micro biological examination of water samples are usually based on tests for the detection and enumeration of indicator organisms rather than that of pathogens

Reason (R): The identification of pathogens in water are not possible.

A) Both A and R are true and R is the correct explanation of A

B) Both A and R are true but R is not a correct explanation of A

C) A is true but R is false

D) A is false but R is true

116. Which trap prevents transmission of unfavourable odours from the washroom to the living area

A) Interception trap

B) Gully Trap

C) Q-trap

D) Nahani trap

117. In transition of sewers from smaller to larger diameter sewers, the continuity of sewers is maintained at the

A) Crowns of the sewer

B) Inverts of the sewer

C) Hydraulic gradients of the sewer

D) Bottom of the concrete bed of the sewers

118. Which of the following group of gases cause photochemical smog?

A) O_3, peroxyacetyl nitrate (PAN) and CO

B) O_3, PAN and NO_2

C) CH_4NO and PAN

D) O_2,PAN and NO_3

119. Which of the following pairs are correctly matched

1. Ozonation - Disinfection
2. Lime soda process - Softening
3. Aeration - Coagulation
4. Nalgonda technique - Fluoride removal

Select the correct answer using the code below:

A) 1, 2 and 3 B) 2,3 and 4

C) 1,3 and 4 D) 1,2 and 4

120. Match List-I (operational problem in rapid gravity filter) with List - II (method to overcome that problem)

List - I	**List - II**
a) Incrustation of filter sand media	1. Compressed air scouring for about 4 minutes at the time of backwashing and manual surface ranking
b) Air binding and development of negative head	2. Washing the filter with sodium hydroxide or bleaching powder occasionally
c) Mud ball formation	3. Through back washing with salt solution after soaking the filter in it
d) Slime growth on filter	4. Increasing the depth of water during filter operation by about 15-20 cm as compared to the normal depth maintained during daily operation and more frequent backwashing

A) a-2 b-4 c-3 d-1 B) a-4 b-2 c-1 d-3

C) a-2 b-4 c-1 d-3 D) a-4 b-2 c-3 d-1

ROUGH WORK

ROUGH WORK

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

Booklet Serial No. 210061

Test Booklet Series

TEST BOOKLET
ASSISTANT PROFESSOR ELECTRICAL AND ELECTRONICS ENGINEERING
Written Test - 2023
(11)

A

Time Allowed: Two Hours *Maximum Marks: 120*

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT*** **write** ***anything else*** on the Test Booklet.
4. This Test booklet contains **120** items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer /Response Sheet provided. *See directions in the Response Sheet.*
6. *All* items carry equal marks.
7. Before you proceed to mark in the Answer /Response Sheet, the response to various items in the Test Booklet, you have to fill in some particulars in the Answer /Response Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer /Response Sheet***. You are permitted to take away with you the Test Booklet and ***Candidate's Copy of the Response Sheet .***
9. Sheets for rough work are appended in the Test Booklet at the end.
10. While writing Centre, Subject and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN".**
11. **Penalty for wrong answers:**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).

    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **(0.25)** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

1. If $\sqrt{41} = 5$, what is the base of these numbers.

   A) 5

   B) 4

   C) 10

   D) None

2. Choose the output of positive edge triggered D flip flop, when *clk* is low and D is high.

   A) No change

   B) Low

   C) High

   D) Insufficient information.

3. Z is a 16 - bit signed integer. 2's complement of Z is $(F87B)_{16}$. The 2's complement of $(8*Z)_{16}$ is?

   A) red $(C3D8)_{16}$

   B) $(C0D8)_{16}$

   C) $(C3D8)_{10}$

   D) None

4. What will be the output frequency of a JK flip flop when J = '1' and K = '1'. Considering the input clock frequency as *f*.

   A) $\frac{f}{4}$

   B) $2f$

   C) f

   D) None

5. In adder, carry propagation can be given as?

   A) a+b

   B) ab

   C) Both

   D) None

6. In excess - 3 code, which of the followng are invalid codes

A) 0000

B) 1001

C) 0110

D) None

7. If $\overline{A}$ and $\overline{B}$ are two inputs to a half adder, the sum expression is

A) $A \oplus B$

B) $\overline{A \oplus B}$

C) (A) and (B)

D) None

8. If A = "11111111" is a two's complement number, then A in decimal is

A) -1

B) 255

C) -255

D) None

9. NAND - NAND realization is equivalent to

A) AND-NOT

B) OR-AND

C) INV-NOR

D) None

10. How many inputs does a decimal - to - BCD encoder have

A) 10

B) 4

C) No. sufficient information

D) None

11. A 4 -bit register is incremented by 1 for every rising edge of the clock. What will be the register value after 20 clock cycles. Assume the initial value of the register to be 0.

A) 20

B) 0

C) 4

D) None

12. The prime implicant which has at least one element that is not present in any other implicant is

A) Essential prime implicant.

B) Prime implicant.

C) Redundant prime implicant

D) None

13. A closed loop control system has the following equation as characteristic equation, $s^3+8ks^2+(k+4)s+20=0$, where k is the open loop gain. Choose the value of k for marginal stability.

A) k=0

B) k=2

C) k=0.55

D) None

14. The program counter of 8085 microprocessor is

A) 8-bit register

B) 16-bit register

C) Not available in 8085

D) None

15. Which of the given motors has insufficient starting torque at full load speed with the same H.P. ratings?

A) Three - phase induction motor

B) Shunt motor.

C) Synchronous motor

D) Differential compound motor.

16. In a synchronous machine, the V curve is drawn between which of the given axes.

A) Field current on X-axis and no - load current on Y - axis.

B) Armature current on X-axis and no - load current on Y-axis.

C) Field current on X-axis and armature current on Y-axis.

D) Armature current on X - axis and field current on Y-axis.

17. In a 3-ϕ induction motor, the starting current is 8 times the rated current, and the rated slip is 6% ,then find the ratio of starting torque to full load torque.

A) 1

B) 1.5

C) 1.75

D) 2

18. The primary reason for a D.C. motor preferred over an A.C. motor

A) Constant speed operation.

B) High - speed operation.

C) Variable speed operation

D) Low - speed operation.

19. CRGO lamination in a transformer are used to minimize.

A) Eddy current loss

B) Hysteresis loss

C) Both Eddy current and Hysteresis loss

D) Ohmic loss

20. From the given devices, which of the transistors is more preferable to design analog and digital circuits?

A) BJT

B) JFET.

C) MOSFET

D) FET

21. At a center frequency of 10^6, a series RLC circuit has a quality factor of 1000. Then, choose the RLC values from the given list.

A) $R = 1\Omega, L = 1\mu H \text{ and } C = 1\mu F$

B) $R = 0.1\Omega, L = 1\mu H \text{ and } C = 1\mu F$

C) $R = 0.001\Omega, L = 1\mu H \text{ and } C = 1\mu F$

D) None

22. A system with $y(t) = x(e^t)$. where, $x(t)$ is an input. The sytem is

A) Casual and time varying

B) Casual and time invariant.

C) Non - Casual and time varying

D) None

23. The signal - to - noise ration (SNR) of an analog to digital converter is a 31.96 dB, for a full scale sinusoidal input. The resolution of the ADC is (approximately).

A) 5 bits

B) 10 bits

C) No sufficient information

D) None

24. In dc chopper, if T_{on} is the on period and f is the chopping frequency, then output voltage in terms of input voltage Vs is given by

A) $\frac{V_s T_{on}}{f}$

B) $\frac{V_s f}{T_{on}}$

C) $\frac{V_s}{f T_{on}}$

D) $V_s T_{on} f$

25. Figure 1 shows the single line diagram of a power system with all reactance marked in per unit (pu) on the same base. The system is on no - load when a 3- phase fault occurs at 'F' on the high voltage side of the transformer T2. The fault current will be

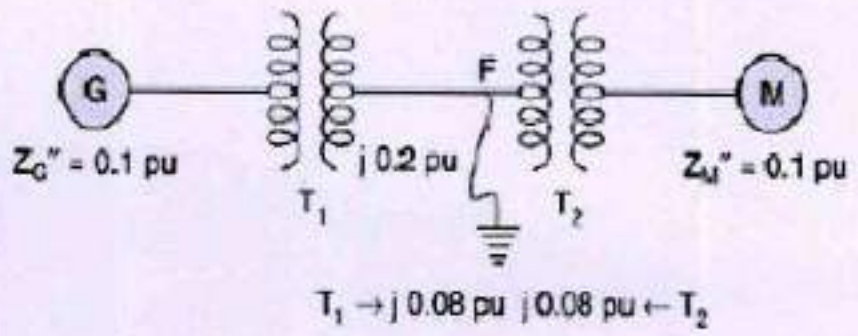


Figure. 1 : Single Line Diagram of a power system

A) -j0.8187 pu

B) +j0.8187 pu

C) -j8.1871 pu

D) +j8.1871 pu

26. A generator is connected to an infinite bus through a double circuit transmission. The fault occurring at the middle of one of the transmission lines is subsequently cleared by opening the circuit breakers at both the ends of the line simultaneously. The transient stability limit of the system is improved by

A) Decreasing the excitation of generator

B) Decreasing the fault - clearing time

C) Increasing the fault - clearing time

D) Increasing the transfer reactance between the generator and infinite bus.

27. Which among the following is an example of a voltage bidirectional two - quadrant switch?

A) SCR

B) BJT

C) Diode

D) MOSFET

28. In a three - phase (50 Hz) full converter, the ripple frequency in output voltage?

A) 50 Hz

B) 100 Hz

C) 150 Hz

D) 300 Hz

29. Which of the given devices is the most suitable power device for a higher frequency (above 100 kHz) switching application.

A) SCR

B) Power MOSFET

C) GTO

D) BJT

30. In the given RLC circuit in Figure 2, the switch is closed till $t = 0^-$ and opened at t=0, then voltage $|V_R|$ (approximately) is

A) 4

B) 2

C) 1

D) None

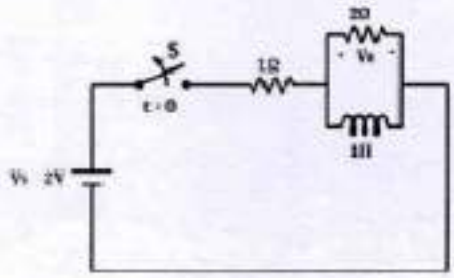


Figure 2: RLC Circuit

31. Equation, $\frac{dy(t)}{dt} + 3y(t) = 2x(t)$, describes a continuous time system. The impulse response of the system, where no initial conditions are given.

A) $2e^{-3t}u(t)$

B) $2e^{-t}u(t)$

C) $e^{-3t}u(t)$

D) None

32. In dc generator, supply to external load is tapped through

A) Brush and springs

B) Brush and commutator

C) Solid connection

D) Helical springs

33. In a shunt generator the voltage build up is generally restricted by

A) Speed limitation

B) Armature heating

C) Insulation restrictions.

D) Saturation of iron

34. What would be the value of pole pitch if there are 80 conductor and 8 poles?

A) 640

B) 64

C) 80

D) 10

35. In dc generator on load, the air gap flux distribution in space is

A) Sinusoidal.

B) Triangular

C) Pulsating

D) Flat tapped.

36. The maximum di/dt in a SCR is

A) Directly proportional to supply voltage.

B) Directly proportional to inductance in the circuit.

C) Inversely proportional to supply voltage

D) Both A and B.

37. The function of snubber circuit connected across the SCR is to

A) Suppress dv/dt.

B) Increase dv/dt.

C) Decrease dv/dt.

D) Decrease di/dt.

38. **Statement A:** Addition of zero to G(s)H(s) the stability of the system improves

Statement B: Addition of pole to G(s)H(s) the stability of the system improves

A) A is True, B is False

B) B is True and A is False

C) Depends on the system

D) None

39. Type - A chopper is used for obtaining which type of mode?

A) Reverse motoring mode

B) Motoring mode.

C) Reverse regenerative braking mode

D) Regenerative braking mode

40. **Statement A:** Due to integral control, the order of a system increases.

Statement B : Due to derivative control, the rise time of the system reduces.

A) A is true B is true.

B) A is False B is True

C) A is False B is False.

D) None

41. In an ideal op-amp, which is not true?

a) Open loop voltage gain is infinite.

b) Input resistance is infinite.

c) Slew rate is infinite.

d) CMRR is zero.

A) b

B) c

C) d

D) a

42. Find the cut off - frequency of the following filter,, given in Figure 3. Considering R1 = 20 K Ohm, R2 = 25 K Ohm and C = 10n F. (Use $\frac{1}{\pi} = 0.32$)

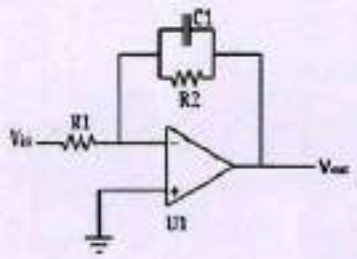


Figure 3 : Op-amp based Filter

A) 640 kHz

B) 640 Hz

C) 256 kHz

D) None

43. Fourier transform of $x(t) = e^{-a|t|}$.

A) $\frac{2a}{a^2 + \omega^2}$

B) $\frac{2a}{a^2 - \omega^2}$

C) $\frac{a}{a^2 + \omega^2}$

D) None

44. According to sampling theorem, Nyquist rate and interval of $\sin(2\pi t)$.

A) 2 Hz, $\frac{1}{2}$sec.

B) $\frac{1}{2}Hz, \frac{1}{2}$sec

C) $\frac{1}{2}Hz$, 2sec

D) 2 Hz, 2 sec

45. Which of the following system is causal?

A) $y[n]=2[n]-3[n+1]$

B) $y[n]=2[n]+3$

C) $y[n]=2[n-7]-3[n+1]$

D) $y[n]=2[n]*3[n+1]$

46. If Fourier transform of $x(t), y(t)$ is $X(\omega)$ and $Y(\omega)$ respectively, then Fourier transform of x(t) y(t) is

A) $X(\omega)Y(\omega)$

B) $\omega X(\omega)Y(\omega)$

C) $X(\omega)+Y(\omega)$

D) None

47. Units of Boltzmann constant is

A) *Joule/Kelvin*

B) *Joule/Kelvin*^{2}

C) *Joule*^{2}*/Kelvin*

D) None

48. Choose a correct statement in regard to bipolar junction transistor in its cut off region.

A) The collector current is zero

B) The base current is non - zero

C) All of the above

D) None

49. Assuming three resistors R_1, R_2, R_3 are connected in parallel and these are related as follows. Given $R_2=2R_1$, $R_3=2R_2$ and total resistance, R_T is 16 KΩ. Then,

A) $R_1=1.75R_T$

B) $R_1=2R_2$

C) $R_1=R_T$

D) None

50. In the given circuit in Figure 4, if load is of 2 Ω, then find the current through the load

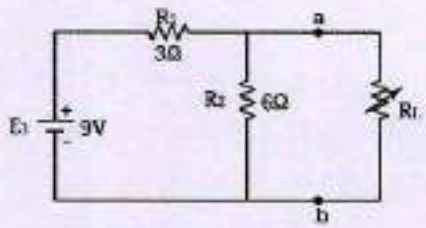


Figure 4: Resistive Circuit

A) 2A

B) 1.5A

C) 3A

D) None

51. As per maximum power transform theorem, in a circuit with variable resistor and fixed reactance. When the source resistance is purely resistive, then

A) $\sqrt{R_S^2+X_L^2}$

B) $\sqrt{R_S^2+X_L^2+X_S^2}$

C) $\sqrt{R_S^2+X_S^2}$

D) None

52. During the measurement of a low resistance using a potentiometer the following readings were obtained : voltage drop across the low resistance under test : 0.422 V, voltage drop cross a 0.1 Ω standard resistance = 1.0235 V. Calculate the value of unknown resistance.

A) 0.0413 Ω

B) 0.0322 Ω

C) 0.0234 Ω

D) 0.0154 Ω

53. Let X1 and X2 be (continuous) periodic functions with periods T1 and T2, respectively. Then, the function $y = x_1 + x_2$ is a periodic, when the following condition satisfy.

A) Ratio of T1/T2 is a complex number

B) Ratio of T1/T2 is an imaginary number

C) Ratio of T1/T2 is a real number

D) Ratio of T1/T2 is a rational number.

54. The Laplace transform of x(t) is X(s) with a ROC of R.Now. What is the ROC of time shifted $x(t-t_0)$.

A) Same as R

B) Shifted by t_0, $R-t_0$

C) Shifted by t_0, $R+t_0$

D) None

55. For an N - periodic sequence x with Fourier - series coefficient sequence a, if x is real and odd

A) a is purely imaginary and odd

B) a is purely real and odd

C) a is purely real and even

D) a is purely imaginary and even

56. The final value theorem in Z - transform for $x(n)$ is $\lim_{n\to\infty} x(n) =$

A) $\lim_{z\to 1}(Z-1)X(Z)$

B) $\lim_{z\to\infty}(Z-1)X(Z)$

C) $\lim_{z\to 0}(Z-1)X(Z)$

D) $\lim_{z\to 1}(Z)X(Z)$

57. Assuming the sequences $x_1(n)$ and $x_2(n)$ having a ROC R_1 and R_2, then the ROC of the sequence $a_1x_1(n)+a_2x_2(n)$ is

A) R_1+R_2

B) R_1

C) $R_1 \cap R_2$

D) None

58. A potentiometer that is accurate to ± 0.0001 V (Standard Deviation) is used to measure current through a standard resistance of $0.1\pm 0.1\%$ (Standard deviation). The voltage across the resistance is measured to be 0.251V. What is the approx. current?

A) 1.8 A

B) 3.7 A

C) 2.5 A

D) 4.5 A

59. **Statement A:** Power of energy signals is 0,

Statement B: Energy of power signal is ∞.

A) A is true and B is false.

B) A and B both are True

C) A and B both are False

D) A is False and B is True.

60. Rectification ratio of a half - wave rectifier is

A) 0.486

B) 0.287

C) 0.812

D) None

61. In NPN transistor if α is 0.96, then β is

A) 24

B) 20

C) 48

D) None

62. **Statement A:** BJT acts as switch in active mode.

Statement B: BJT acts as amplifier in saturation mode.

A) A is True and B is false.

B) A and B both are true.

C) A and B both are false.

D) A is False and B is true.

63. **Statement A:** NMOS devices are fast switching devices since electron mobility is less than holes.

Statement B: NMOS devices are not TTL compatible since they use negative V_{GS} and V_d

A) A is True and B is False

B) A and B both are True.

C) A and B both are false.

D) A is False and B is True.

64. A JFET is connected with a drain load resistor of 4 KΩ, supply voltage is 30V. Considering the V_D to be 20 V. The drain current is

A) 2.1 A.

B) 2.5 mA

C) 0.21 A

D) None

65. The symbol shown in Figure 5 corresponds to

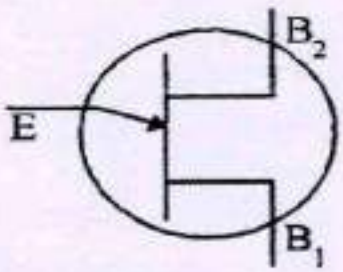


Figure 5 : Symbol for reference

A) Uni Junction Transistor

B) NMOS Depletion Transistor

C) PMOS Depletion Transistor

D) None

66. A circuit with n parallel loads with powers $P_1, P_2, \ldots\ldots P_n$. Then the total power supplied by source is

A) $P_1+P_2+P_3+\ldots\ldots+P_n$

B) Average of $(P_1, P_2 \ldots\ldots P_n)$

C) Maximum of $(P_1, P_2 \ldots\ldots P_n)$

D) None

67. Figure 6 gives the current flowing through an element, what is the net charge passes through the element between time = 4 to 12 seconds. The x-axis is time (seconds) and y-axis is current (in A).

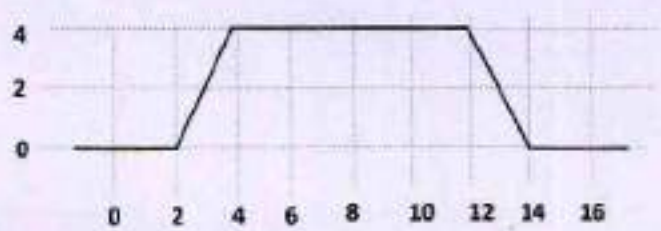


Figure 6 : current flowing through an element; Current Vs Time Plot

A) 4C

B) 32C

C) 8C

D) 16C

68. In the circuit given in Figure 7, estimate the total resistance between nodes A and B.

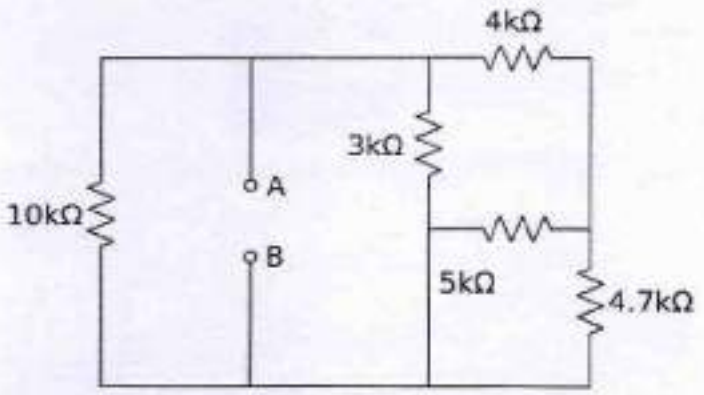


Figure 7 : Resistive Network

A) 1.7 K
B) 17 K
C) 1.7
D) None

69. In a magnetic coupled circuit with two inductively coupled coils with 50mH and 200mH as their self inductance. Calculate the mutual inductance between those coils, assuming coefficient of coupling as 0.5.
A) 50 mH
B) 100 mH
C) 150 mH
D) 200 mH

70. In an ideal transformer with a primary of 10 turns and secondary of 100 turns. Find Z_{in} for a given 1000 Ω placed across the seondary.
A) 1 Ω
B) 10 Ω
C) 100 Ω
D) 1000 Ω

71. A symmetrical 3- phase with a 400 V, 50 Hz supply system with balanced delta load. The current in each phase is 20 A and lags behind its phase voltage by an angle of 40°. Then, line current is (approximately).
A) 35 A
B) 20 A
C) 10 A
D) 60 A

72. Consider $f(t) = 3u(t) + 2e^{-t}$, what is the final value of the function at time = ∞.

A) 3

B) 5

C) 0

D) ∞

73. For the given circuit in Figure 8, find the equivalent impedance in s-domain.

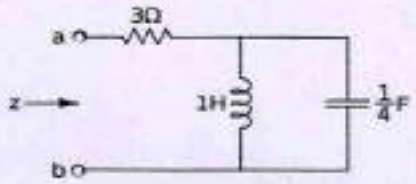


Figure 8 : RLC Circuit

A) $\frac{s^2+4s+12}{s^2+4}$

B) $\frac{3s^2+s+12}{s^2-4}$

C) $\frac{3s^2+4s+12}{s^2-4}$

D) $\frac{3s^2+4s+12}{s^2+4}$

74. A stable system has

A) Positive phase margin and negative gain margin.

B) Negative phase margin and positive gain margin.

C) Negative phase margin and negative gain margin.

D) Positive phase margin and positive gain margin.

75. A system with open loop poles at s=0, s = −3 + j4 and s = −3 − j4 only. Then, the angle of asymptoms is

A) $\pm 60°, 180°$

B) $+90°, \pm 180°$

C) $60°, \pm 180°$

D) $-60°, \pm 180°$

76. Steady state error of a type - 2 system for unit ramp input is

A) 1
B) 0
C) ∞
D) None

77. A system with a pole at -5 and zero at -1, then the system has which type of network

A) Lag network
B) Lead network
C) Lead - Lag network
D) Lag - Lead network.

78. A system with $G(s)=\frac{4}{s(s+2)}$, then the closed loop poles are

A) $1\pm j\sqrt{3}$
B) $-1\pm j\sqrt{3}$
C) $1-j\sqrt{3}$
D) $\pm 1-j\sqrt{3}$

79. A system with characteristic equation $s^3+4s^2+5s+K=0$, then the value of K (one value is enough) at break - in and break - away points is

A) 2
B) 4
C) 0
D) No break in and break sway points

80. Given $A=\begin{bmatrix}0 & 1\\ 0 & -2\end{bmatrix}$, then calculate e^{At}.

A) $\begin{bmatrix}1 & 1/2(1-e^{-2t})\\ 0 & e^{2t}\end{bmatrix}$

B) $\begin{bmatrix}1 & 1/2(1-e^{-2t})\\ 1 & e^{-2t}\end{bmatrix}$

C) $\begin{bmatrix}1 & 1/2(1+e^{-2t})\\ 0 & e^{-2t}\end{bmatrix}$

D) None

81. In 8085, 16-bit address bus, which can address upto?

A) 16 KB

B) 32 KB

C) 64 KB

D) 28 KB

82. A filter with a pass band gain of 2, the relation between R_f and R_1, R_f is the feedback resistor in the op amp.

A) $R_f = 2R_1$

B) $R_f = 0.5R_1$

C) $R_f = R_1$

D) $R_f + R_1 = 2$

83. In a low pass active filter with a cut - off frequency of 1kHz, then the value of R for a C of 0.01 μ F.

A) 160 kΩ

B) 1 kΩ

C) 16 kΩ

D) None

84. A band pass filter with 300 Hz and 3 KHz as the cut - off frequencies for the pass band. Then, quality factor is

A) 0.95

B) 1.0

C) 0.35

D) In sufficient information.

85. **Statement A:** superposition theorem is valid for linear circuit elements.

Statement B: Superposition theorem can be used to calculate power in the load due to various sources.

A) A is true and B is false

B) A and B both are true.

C) A and B both are Flase

D) A is false and B is true.

86. If $F(s)=\frac{1}{s}\frac{s+1}{s+k}$ and f(t) at t = ∞ is $\frac{1}{2}$. Then, k is

A) $\frac{1}{2}$

B) 1

C) 2

D) ∞

87. In a two port network,

Statement A: condition for reciprocity is $z_{12}=z_{21}$

Statement B: condition for symmetry is (AD-BC) =1

A) A and B both are true.

B) A and B both are false.

C) A is true and B is false.

D) A is false and B is true.

88. The duality of a network increases the number of elements in the circuits.

A) True

B) False.

C) Depends on the elements

D) In sufficient information.

89. A delta network with resistors R is converted to start network, then the resistors at nodes 1, 2 and 3 are

A) $\frac{R}{2},\frac{R}{3}and\frac{R}{2}$

B) $\frac{R}{3},\frac{R}{3},\frac{R}{3}$

C) $3R,\frac{R}{3},3R$

D) $R,\frac{R}{3},\frac{R}{3}$

90. In a polar plot,

Statement A: Polar plot of $j\omega$ is along the positive imaginary axis with starting at origin

Statement B: Polar plot of $\frac{1}{j\omega}$ is along the negative imaginary axis, with stating at origin

A) A and B both are True.

B) A and B both are False

C) A is True and B is False

D) A is false and B is true.

91. The given equation $\nabla.B = 0$ is one of the Maxwell's equation. Choose an equivalent to the same from the below.

A) $\oint_L B.dS = \rho$

B) $\oint_L B.dS = 0$

C) $\oint_L B.dS = \int_S J.\mathrm{dS}$

D) None

92. In a static EM field, choose the correct Maxwell's equation

A) $\nabla.D = 0$

B) $\nabla.\mathrm{H} = \rho$

C) $\nabla \times E = 0$

D) None

93. In a series magnetic circuit with n elements whose magneto motive forces are $x_1, x_2, \ldots\ldots x_n$, then choose the correct relation.

A) Equivalent magneto motive force is the sum of individual magneto motive forces.

B) Equivalent magneto motive force is maximum of individual magneto motive forces.

C) Equivalent magneto motive force is the average of individual magneto motive forces.

D) None

94. The preferred polarization for statellite communication is

A) Linear

B) Elliptical

C) Circular

D) Spatial

95. What happens to the speed of an EM wave in a homogeneous dielectric medium compared to that in vacuum?

A) It increases

B) It increases and decreases halfway.

C) It decreases.

D) It remains same.

96. What is the dominant mode for a rectangular waveguide?

A) TE 10

B) TM 10

C) TE 01

D) TM 01

97. In a standing wave, standing wave ratio is the ratio of

A) Maximum and minimum energy.

B) Maximum and minimum power

C) Maximum and minimum voltage.

D) None.

98. A potential divider is designed to have large numbers of turns, such that

A) Smooth variation in current is obtained

B) Smooth variation in impedance is obtained

C) Smooth variation in voltage is obtained

D) Smooth variation in power is obtained

99. A resistance is rated at 3200 Ω and the current flowing through it is 64 mA. (a), Compute the power loss in the resistor. (b) It was later found that the resistance of the resistor was 0.2 percent greater than the specified resistance and the ammeter read 0.75 percent more than the true current. Determine the known error in the computed power in part (a).

A) 13.1 W and 1.7%

B) 14.1 W and 2%

C) 15.1 W and 2.7%

D) 16.1 W and 3%

100. The angle of incident for which there is no reflection is known as

A) Reflected angle.

B) Critical angle.

C) Angle of total internal reflection.

D) Brewster angle.

101. Compared to dipole atenna, gain and directivity of the monopole antenna are

A) Less than dipole antenna.

B) Higher than dipole antenna.

C) Equal to dipole antenna.

D) Half of the dipole antenna.

102. For Elliptical polarization the angle between two components of Electric field is

A) 45

B) 60

C) 90

D) 180

103. **Statement A:** Sum of two odd functions is odd

Statement B: Product of two even functions is even

A) Both A and B are True

B) A is True and B is Flase.

C) A is False and B is True

D) Both A and B are False

104. For any given signal $x(t)$, convolution of $x(t)$ and $\delta(t)$ is $x(t)$.

A) True.

B) False.

C) True for even signals only

D) True for odd signals only.

105. In a two port network, which is the correct statement.

A) z parameters are the open circuit admittance parameters

B) y parameters are the short circuit transmission parameters

C) z parameters are the open circuit impedance parameters

D) All of the above

106. A memory with 16 GB capacity, how many address lines are required to access a location.

A) 32

B) 34

C) 9

D) 13

107. Which of the following converter circuit operations will be unstable for a large duty cycle ratio?

A) Boost converter

B) Boost converter and Buck - Boost converter

C) Buck converter

D) Buck - Boost converter

108. Types of electrical transients that occur in power system

A) Impulsive transient

B) Oscillatory transient

C) Both

D) None of these

109. Cause of power interruption.

A) Power system fault

B) Equipment failure

C) Cascading failure

D) All of the above

110. The parameters that define the quality of electrical power

A) Voltage.

B) Current

C) Frequency

D) All of these

111. Ferranti effect on long overhead lines is experience when it is:

A) Lightly loaded

B) On full load at unity p.f.

C) On full load at 0.8 p.f. lag

D) In all these cases.

112. If two synchronous generators are connected, loss of synchronism will result in :

A) Stalling of generators.

B) Wild fluctuations in current.

C) Wild fluctuations in current and voltage.

D) None of the above

113. For the system shown in Figure 9, a line-to- ground fault on the line side of the transformer is equivalent to :

A) A line - to - ground fault on the generator side of the transformer.

B) A line - to - line fault on the generator side of the transformer.

C) A double line - to - ground on the generator side of the transformer.

D) A 3 - phase fault on the generator side of the transformer.

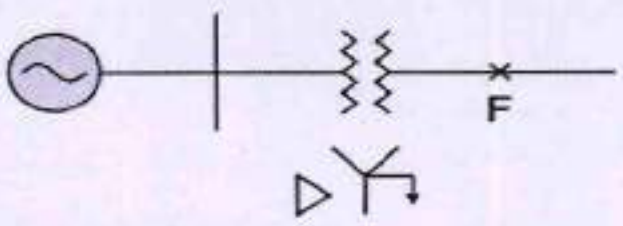


Figure 9 : System

114. When there is a change in load in a power station having a number of generator units operating in parallel, the system frequency is controlled by

A) Adjusting the steam input to the units.

B) Adjusting the field - excitation of the generators.

C) Changing the load divisions between the units.

D) Injecting reactive power at the station bus bar.

115. The plot shown in Figure 10 is the voltage across a power semiconductor device and current throught the device during switching transitions. Whether the transition is a turn ON transition or a turn - OFF transition? What is the energy lost during the transition?

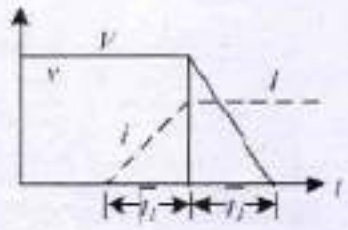


Figure 10 : Voltage across power semiconductor device

A) Turn ON, $\frac{VI}{2}(t1+t2)$

B) Turn OFF, $VI(t1+t2)$

C) Turn ON, $VI(t1+t2)$

D) Turn OFF, $\frac{VI}{2}(t1+t2)$

116. For the switching converter shown in Figure 11, assumed steady state operation. Also assume that the components are ideal, the inductor current is always positive and continuous and switching period is T_s. If voltage V_L is as shown, the duty cycle of the switch S is :

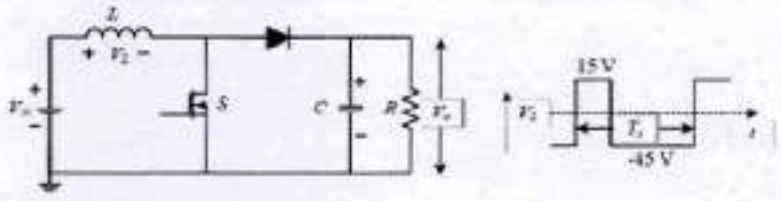


Figure 11 : Switching Converter

A) 0.55

B) 0.75

C) 0.60

D) 0.30

117. In the copper circuit shown in Figure 12, the input dc voltage has a constant value V_s. The output voltage V_0 is assumed ripple free. The switch S is operated with a switching time period

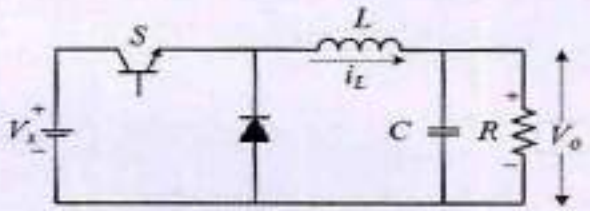


Figure 12 : Circuit

T and a duty ratio D. What is the value of D at the boundary of continuous and discontinuous conduction of the inductor current i_L?

A) $D = 1 - \frac{V_s}{V_0}$

B) $D = \frac{2L}{RT}$

C) $D = 1 - \frac{2L}{RT}$

D) $D = \frac{RT}{L}$

118. In a thyristor DC chopper, which type of commutation results in the best performance?

A) Voltage commutation.
B) Current commutation.
C) Load commutation.
D) Supply commutation.

119. If $\Phi(t)$ is a state transition matrix, then choose a correct property from the given list.

1. $\Phi(0) = 1$
2. $\Phi^{-1}(t) = -\Phi(t)$
3. $\Phi^{-1}(t_2 + t_1) = \Phi(t_1) + \Phi(t_2)$
4. $\Phi(t_1)\Phi(t_2) = \Phi(t_2)\Phi(t_1)$

A) 1 and 2
B) 1 and 4
C) 1,2 and 4
D) 1,3 and 4

120. At gain crossover frequency $\omega = 12 rad/s$, $\angle(G(j\omega)H(j\omega)) = -195°$, Then the system is

A) Stable
B) Unstable
C) Conditionally stable.
D) Marginally stable.

ROUGH WORK

ROUGH WORK

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

Booklet Serial No.

Test Booklet Series

TEST BOOKLET
ASSISTANT PROFESSOR
ELECTRICAL ENGINEERING
Written Test - 2023
(12)

A

Time Allowed: Two Hours ***Maximum Marks: 120***

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside.
   DO NOT **write** ***anything else*** on the Test Booklet.
4. This Test booklet contains **120** items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer /Response Sheet provided. *See directions in the Response Sheet.*
6. ***All*** items carry equal marks.
7. Before you proceed to mark in the Answer /Response Sheet, the response to various items in the Test Booklet, you have to fill in some particulars in the Answer /Response Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer /Response Sheet***. You are permitted to take away with you the Test Booklet and ***Candidate's Copy of the Response Sheet .***
9. Sheets for rough work are appended in the Test Booklet at the end.
10. While writing Centre, Subject and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN".**
11. **Penalty for wrong answers:**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).

    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **(0.25)** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

1. Aluminium is not used as winding wire for the armature of dc machine because
   A) Aluminium has low resistivity
   B) Of large winding space required by aluminium conductor
   C) Of low thermal conductivity of aluminium
   D) Of high cost of aluminium

2. In dc generator, supply to external load is tapped through
   A) Brush and springs
   B) Brush and commutator
   C) Solid connection
   D) Helical springs

3. In a shunt generator the voltage build up is generally restricted by
   A) Speed limitation
   B) Armature heating
   C) Insulation restrictions
   D) Saturation of iron

4. What would be the value of pole pitch if there are 80 conductor and 8 poles?
   A) 640
   B) 64
   C) 80
   D) 10

5. In dc generator on load, the air gap flux distribution in space is
   A) Sinusoidal
   B) Triangular
   C) Pulsating
   D) Flat tapped

6. The maximum di/dt in a SCR is
   A) Directly proportional to supply voltage.
   B) Directly proportional to inductance in the circuit.
   C) Inversely proportional to supply voltage.
   D) Both A and B.

7. The function of snubber circuit connected across the SCR is to
   A) Suppress dv/dt
   B) Increase dv/dt
   C) Decrease dv/dt
   D) Decrease di/dt

8. Type-A chopper is used for obtaining which type of mode?
   A) Reverse motoring mode
   B) Motoring mode
   C) Reverse regenerative braking mode
   D) Regenerative braking mode

9. Which of the following converter circuit operations will be unstable for a large duty cycle ratio?
   A) Boost converter
   B) Boost converter and Buck-Boost converter
   C) Buck converter
   D) Buck-Boost converter

10. How many types of electrical drives are there based on supply?
   A) 2
   B) 3
   C) 4
   D) 1

11. The power factor of a single-phase load can be calculated if the instruments available are
   A) One voltmeter and one ammeter
   B) One voltmeter, one ammeter and one wattmeter
   C) One voltmeter, one ammeter and one energy meter
   D) Any of the above

12. For measurements on high voltage capacitors, the suitable bridge is
   A) Wien bridge
   B) Modified De Santy's bridge
   C) Schering Bridge
   D) Any of the above

13. The operating voltage of a Meggar is about
   A) 6V
   B) 12V
   C) 40V
   D) 100V

14. A dynamometer wattmeter can be used for
    A) Both D.C. and A.C.
    B) D.C. only
    C) A.C. only
    D) Any of the above

15. An instrument transformer is used to extend the range of
    A) Induction instrument
    B) Electrostatic instrument
    C) Moving coil instrument
    D) Any of the above

16. In electrical measuring instruments electrical energy is converted to
    A) Mechanical energy
    B) Heat energy
    C) Chemical energy
    D) Light energy

17. Types of electrical transients that occur in power system
    A) Impulsive transient
    B) Oscillatory transient
    C) Both
    D) None of these

18. Range of high frequency oscillatory transient
    A) Less than 5kHz
    B) 5 to 500kHz
    C) 0.5 to 5 MHz
    D) None of these

19. Cause of power interruption
    A) Power system fault
    B) Equipment failure
    C) Cascading failure
    D) All of the above

20. The parameters that define the quality of electrical power
    A) Voltage
    B) Current
    C) Frequency
    D) All of these

21. Minimize the following boolean function

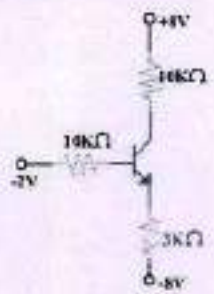
$F(A, B, C) = \Sigma m\,(0, 1, 6, 7) + \Sigma d\,(3, 5)$

A) A'B'+AB
B) A+A'B'
C) AB'
D) AB+B'

22. Firing angle of the use for _____

A) To burn device any time of SCR
B) To control on-off timing of SCR
C) To control off timing of general transistor
D) To control on timing of the diode without controller

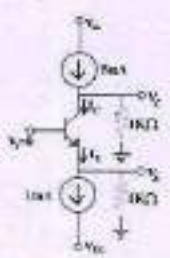
23. The common emitter current gain of the transistor is $\beta = 75$ The voltage V_{BE} in on state is 0.7 Volt. The value of V_{EC} is



A) 3.5V
B) 2V
C) 1.2V
D) 4.IV

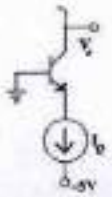
where V_{BE} and V_{EC} are the voltage across base and emitter and Emitter and Collector respectively.

24. For the transistor shown below assume $\alpha = 1$ and $V_{BE} = 0.7V$ at the edge of conduction. What are the values of V_E and V_C for $V_B = 0$?



A) -0.7 V, 4.7 V
B) -0.7 V, 5 V
C) -0.7 V, 5.7 V
D) -1 V, -0.5 V

25. For the given circuit, $V_{CE} = 0.5V$ and $\beta = 100$ The value of I_Q is.

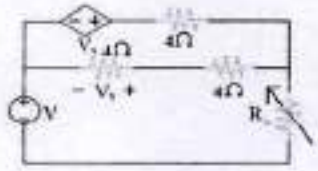


A) 0.5 mA
B) 0.1 mA
C) 0.15 mA
D) 0.909 mA

26. The line A to neutral voltage is $10\angle 15°V$ for a balanced three phase star-connected load with phase sequence ABC. The voltage of line B with respect to line C is given by

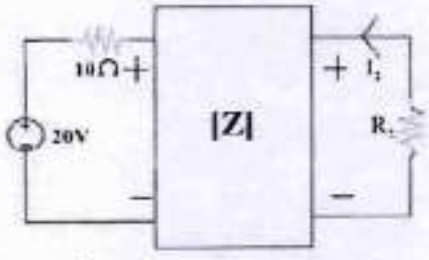
A) $10\sqrt{3}\angle 105°$
B) $10\angle 105°$
C) $10\sqrt{3}\angle -75°$
D) $-10\sqrt{3}\angle -90°$

27. Find the value of R_L for maximum power transfer in the circuit shown below.



A) 2 Ω
B) 4 Ω
C) 10 Ω
D) 8.2 Ω

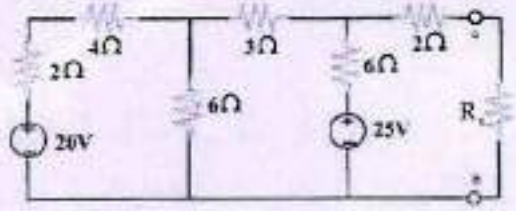
28. A two-port network is shown in the below figure. The Z parameters of the network are $Z_{11} = 40\ \Omega$; $Z_{12} = 60\ \Omega$, $Z_{21} = 80\ \Omega$ and $Z_{22} = 100\ \Omega$



Find the value of I_2, when $R_L = 20\ \Omega$.

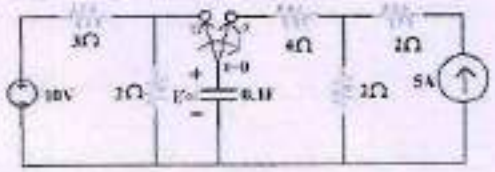
A) -4/3 A
B) 3/4 A
C) 9/5 A
D) 10/17 A

29. Find the Thevenin's equivalent resistance R_{th} and voltage V_{th} across the terminal a-b of the below network.



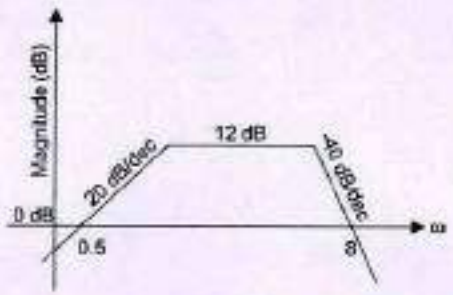
A) $R_{th} = 5\,\Omega, V_{th} = 17.5\,V$
B) $R_{th} = 2\,\Omega, V_{th} = 17.5\,V$
C) $R_{th} = 5\,\Omega, V_{th} = 20\,V$
D) $R_{th} = 3\,\Omega, V_{th} = 15.5\,V$

30. The switch in the below circuit has been closed for a long time at position 1, and it is moved to position 2 at t=0. Find the voltage expression $V_c(t)$ across the capacitor C.



A) $Y_c(t) = (10 - 6e^{-t/0.6})$
B) $V_c(t) = (10 - 6e^{-t/0.6})u(t)$
C) $V_c(t) = (10 - 6e^{-t})$
D) $V_c(t) = (10 - 6e^{-t})u(t)$

31. Consider the following asymptotic Bode magnitude plot (ω is in rad/s).



Which one of the following transfer functions is best represented by the above Bode magnitude plot?

A) $\dfrac{2s}{(1+0.5s)(1+0.25s)^2}$
B) $\dfrac{4(1+0.5s)}{s(1+0.25s)}$
C) $\dfrac{2s}{(1+2s)(1+4s)}$
D) $\dfrac{4s}{(1+2s)(1+4s)^2}$

32. A second-order real system has the following properties:

The damping ratio $\xi = 0.5$ and undamped natural frequency $\omega_n = 10$rad/s, the steady state value at zero is 1.02.

The transfer function of the system is

A) $\frac{1.02}{s^2+5s+100}$

B) $\frac{102}{s^2+10s+100}$

C) $\frac{100}{s^2+10s+100}$

D) $\frac{102}{s^2+5s+100}$

33. The number of roots of the polynomial, $s^7 + s^6 + 7s^5 + 14s^4 + 31s^3 + 73s^2 + 25s + 200$, in the open left half of the complex plane is

A) 3

B) 4

C) 5

D) 7

34. Consider a linear time-invariant system whose input r(t) and output y(t) are related by the following differential equation:

$$\frac{d^2y(t)}{dt^2} + 4y(t) = 6r(t)$$

The poles of this system are at

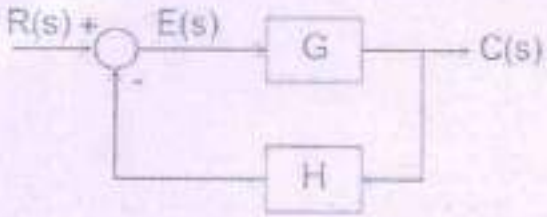
A) +2j, -2j

B) -4, +4

C) +2, -2

D) +4j, -4j

35. For the closed-loop system shown, the transfer function $\frac{E(s)}{R(s)}$ is



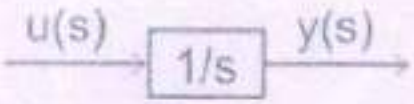
A) $\frac{G}{1+GH}$

B) $\frac{1}{1+GH}$

C) $\frac{GH}{1+GH}$

D) $\frac{1}{1+GH}$

36. Assuming zero initial condition, the response y(t) of the system given below to a unit step



input u(t) is:

A) u(t)

B) $(t^2/2)\,u(t)$

C) $t\,u(t)$

D) $e^t\,u(t)$

37. Mho relay is normally used for the protection of:

A) Long transmission lines

B) Medium length lines

C) Short length lines

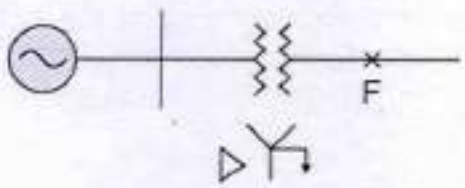
D) No length criterion.

38. For the protection of parallel feeders fed from one end the relays required are:
A) Non-directional relays at the source end and directional relays at the load end.
B) Non-directional relays at both the ends.
C) Directional relays at the source end and non-directional at the load end.
D) Directional relays at both the ends.

39. Ferranti effect on long overhead lines is experienced when it is:
A) Lightly loaded
B) On full load at unity p.f.
C) On full load at 0.8 p.f. lag
D) In all these cases

40. If two synchronous generators are connected, loss of synchronism will result in:
A) Stalling of generators
B) Wild fluctuations in current
C) Wild fluctuations in current and voltage
D) None of the above

41. For the system shown in diagram below, a line-to-ground fault on the line side of the transformer is equivalent to:



A) A line-to-ground fault on the generator side of the transformer
B) A line-to-line fault on the generator side of the transformer
C) A double line-to-ground on the generator side of the transformer
D) A 3-phase fault on the generator side of the transformer.

42. When there is a change in load in a power station having a number of generator units operating in parallel, the system frequency is controlled by
A) adjusting the steam input to the units
B) adjusting the field-excitation of the generators
C) changing the load divisions between the units
D) injecting reactive power at the station bus bar.

43. A triac can be triggered by a gate pulse of which polarity?

A) Positive polarity only

B) Negative polarity only

C) Either positive or negative polarity

D) Alternating polarity

44. A switched-mode power supply operating at 20 kHz to 100 kHz range uses the main switching element:

A) Thyristor

B) MOSFET

C) Triac

D) UJT

45. The MOSFET switch in its ON state may be considered equivalent to

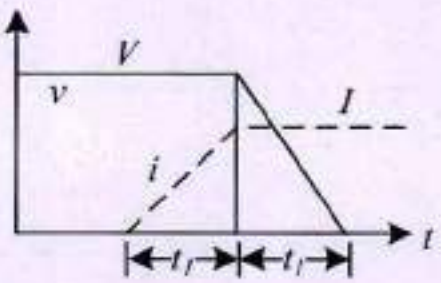
A) Resistor

B) Inductor

C) Capacitor

D) Battery

46. The figure shows the voltage across a power semiconductor device and current through the device during switching transitions. Weather the transition is a turn ON transition or a turn OFF transition? What is the energy lost during the transition?



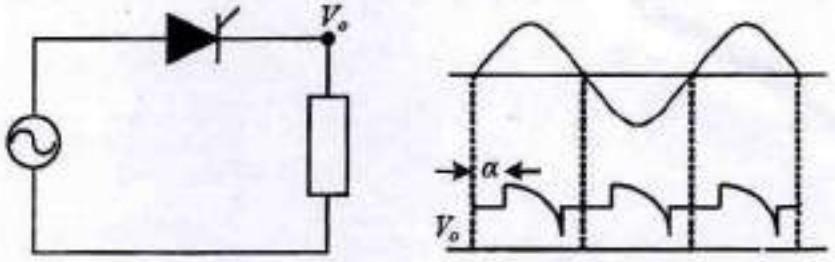
A) Turn ON, $\frac{VI}{2}(t_1+t_2)$

B) Turn OFF, $VI(t_1+t_2)$

C) Turn ON, $VI(t_1+t_2)$

D) Turn OFF, $\frac{VI}{2}(t_1+t_2)$

47. Referring to the figures, the type of load is:

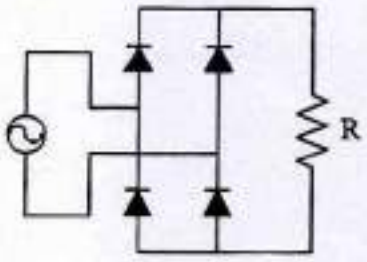


A) Inductive load
B) Resistive load
C) DC motor (RLE) load
D) Capacitive load

48. A three-phase, fully controlled, converter is feeding power into a DC load at a constant current of 150 A. The rms current through each thyristor of the converter is:

A) 50 A
B) 100 A
C) $\frac{150\sqrt{2}}{\sqrt{3}} A$
D) $\frac{150}{\sqrt{3}} A$

49. In the single-phase, diode bridge rectifier shown in figure, the load resistor is $R = 50\,\Omega$. The source voltage is $V - 200$ Sin ωt, where $\omega = 2\pi \times 50$ radian per second. The power dissipated in the load resistor R is:



A) $\frac{3200}{\pi}$ W
B) $\frac{400}{\pi}$ W
C) 400 W
D) 800 W

50. A three-phase diode bridge rectifier is fed from a 400 V RMS, 50 Hz, three-phase AC source. If the load is purely resistive, then peak instantaneous output voltage is equal to:

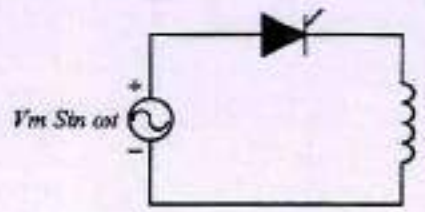
A) 400 V

B) $400\sqrt{2}$ V

C) $400\sqrt{\frac{2}{3}}$ V

D) $\frac{400}{\sqrt{3}}$ V

51. A half wave thyristor converter supplies a purely inductive load as shown in figure. If triggering angle of thyristor is 120°. The extinction angle will be:



A) 240°

B) 180°

C) 200°

D) 120°

52. In a thyristor DC chopper, which type of commutation results in the best performance?

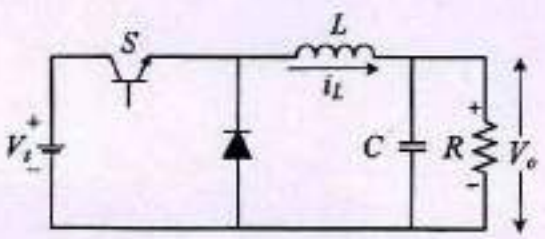
A) Voltage commutation

B) Current commutation

C) Load commutation

D) Supply commutation

53. In the copper circuit shown in figure, the input dc voltage has a constant value V_s. The output voltage V_o is assumed ripple free. The switch S is operated with a switching time period T and a duty ratio D. What is the value of D at the boundary of continuous and discontinuous conduction of the inductor current i_L?



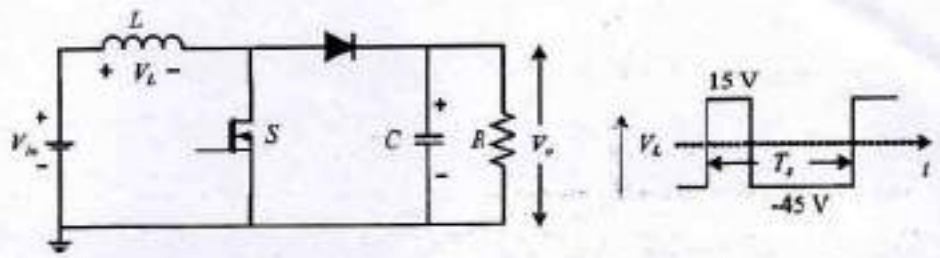
A) $D=1-\frac{Vs}{Vo}$

B) $D=\frac{2L}{RT}$

C) $D=1-\frac{2L}{RT}$

D) $D=\frac{RT}{L}$

54. For the switching converter shown in the following figure, assumed steady state operation. Also assume that the components are ideal, the inductor current is always positive and continuous and switching period is T_s. If voltage V_L is as shown, the duty cycle of the switch S is:

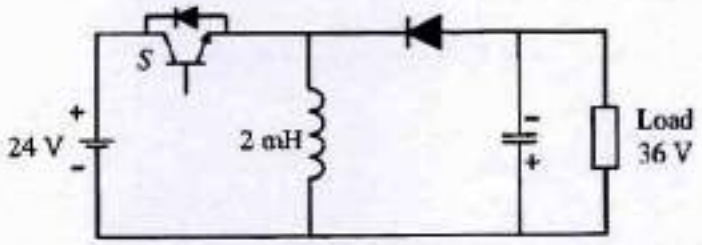


A) 0.55
B) 0.75
C) 0.60
D) 0.30

55. In dc chopper, if T_{on} is the on period and f is the chopping frequency, then output voltage in term of input voltage V_s is given by:

A) $V_s T_{on} f$
B) $V_s f / T_{on}$
C) $V_s / T_{on} \cdot f$
D) $V_s T_{on} f$

56. A buck-boost DC-DC Converter shown in the figure below, is used to convert 24 V battery voltage to 36 V DC voltage to feed a load of 72 Ω. It is operated at 20 kHz with an inductor of 2 mH and output capacitor of 1000 μF all devices are considered to be ideal. How much peak voltage will be across the solid-state switch?



A) 60 V
B) 24 V
C) 55 V
D) 36 V

57. For type-A chopper, V_s is the source voltage, R is the load resistance, and α is the duty cycle. The average output voltage will be:

A) αV_s
B) $(1-\alpha)V_s$
C) V_s/α
D) $V_s/(1-\alpha)$

58. In DC Choppers, per unit ripple is maximum, when duty cycle d is:

A) 0.2
B) 0.5
C) 0.7
D) 0.9

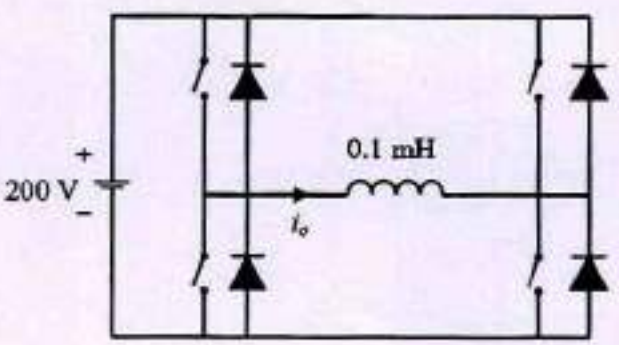
59. When a line commuted converter operates in the inverter mode?

A) It draws both real and reactive power from ac supply.
B) It delivers both real and reactive power to the ac supply.
C) It delivers real power to the ac supply.
D) It draws reactive power from the ac supply.

60. Triangular PWM control, when applied to a three-phase BJT based voltage source inverter, introduces:

A) Low order harmonic voltages on the dc side.
B) Very high order harmonic voltage on the dc side.
C) Low adder harmonic voltage on the ac side.
D) Very high order harmonic voltage on the ac side.

61. A single-phase voltage source inverter is feeding a purely inductive load, as shown in the figure.



The inverter is operated at 50 Hz in 180° square wave mode. Assume that the load current does not have any dc component. The peak value of inductor current i_o be:

A) 6.37 A
B) 10 A
C) 20 A
D) 40 A

62. In a single phase, DC to AC inverter, using single pulse modulation for control of output voltage, harmonics of the order n can be eliminated by making the pulse width β.

A) $\frac{4\pi}{n}$

B) $\frac{2\pi}{n}$

C) $\frac{\pi}{n}$

D) $\frac{\pi}{2n}$

63. Which of the following methods is the strongest tool to determine the stability and the transient response of the system?

A) Routh- Hurwitz criterion
B) Bode plot.
C) Nyquist plot
D) Root locus

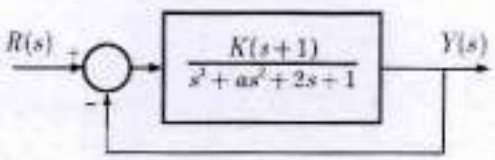
64. The open loop DC gain of a unity negative feedback system with closed-loop transfer function $\frac{s+4}{s^2+7s+13}$ is

A) 4/13
B) 4/9
C) 4
D) 13

65. An open loop system represented by the transfer function $G(s) = \frac{s-4}{(s+2)(s+3)}$ is

A) Stable and of the minimum phase type
B) Stable and of the non-minimum phase type
C) Unstable and the minimum phase type
D) Unstable and of the non-minimum phase type

66. The feedback system shown below oscillates at 2 rad /s when



A) K = 2 and a = 0.75
B) K = 3 and a = 0.75
C) K = 4 and a = 0.5
D) K = 2 and a = 0.5

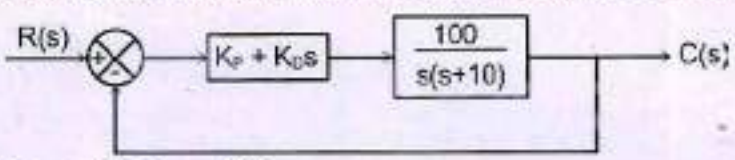
67. For the power semiconductor devices IGBT, MOSFET, Diode, and Thyristor, which one of the following statements is TRUE?

A) All four are majority carrier devices
B) All four are minority carrier devices
C) IGBT and MOSFET are majority carrier devices, whereas Diode and Thyristor are minority carrier devices
D) MOSFET is a majority carrier device, whereas IGBT, Diode, Thyristor are minority carrier devices

68. Find the number of asymptotes for the given open-loop transfer function of a unity feedback system: $G(S)=\frac{((+2)(s+3)(s+4))}{((s+5)(s+6)(s+1))}$

A) 1 B) 0
C) 2 D) 3

69. A Control system with PD controller is shown. If velocity error constant is $K_v = 1000$ and the damping ratio is 0.5 then the values of K_P and K_D Should be:



A) $K_P = 100, K_D = 0.09$
B) $K_P = 100, K_D = 0.9$
C) $K_P = 10, K_D = 0.09$
D) $K_P = 10, K_D = 0.9$

70. What will be the controller output for PD controller at t = 2s, if the error begins to change from 0 at the rate of 1.2% /s? The given parameters are Po = 50%, Kp = 4, and KD = 0.4.

A) 61.52%
B) 61.92%
C) 51.52%
D) 51.92%

71. The following set of differential equations describes a linear second-order single input continuous-time system.

$X_1'(t) = -2X_1(t) + 4X_2(t)$
$X_2'(t) = 2X_1(t) - X_2(t) + u(t)$

Here, $X_1(t)$ and $X_2(t)$ are the state variables, and u(t) is the control variable. Check for the system, if it is:

A) Uncontrollable and unstable
B) Controllable but unstable
C) Controllable and stable
D) Uncontrollable and stable

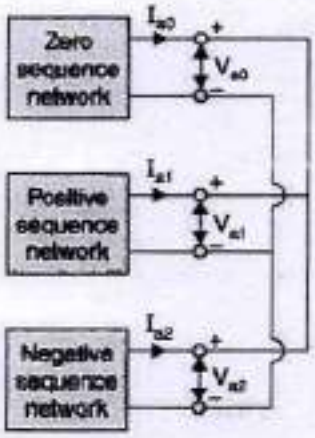
72. A 100 km transmission line is designed for a nominal voltage of 132 kV and consists of one conductor per phase. The line reactance is 0.726 ohm/km. The static transmission capacity of the line, in Megawatts, would be

A) 132
B) 240
C) 416
D) 720

73. A single line to ground fault occurs on an unloaded generator in phase a. If $x_1 = x_2 = 0.25$ p.u., $x_0 = 0.15$ p.u., reactance connected in the neutral $x_n = 0.05$ p.u. and the initial prefault voltage is 1.0 p.u., then the magnitude of the fault current will be

A) 3.75 p.u.
B) 1.54 p.u.
C) 1.43 p.u.
D) 1.25 p.u

74. The connection diagram of sequence networks for a particular fault on a power system network is given in the figure. The type of the fault is



A) single line to ground fault
B) double line to ground fault
C) line to line fault
D) open circuit.

75. The incremental fuel cost for two generating units is given by

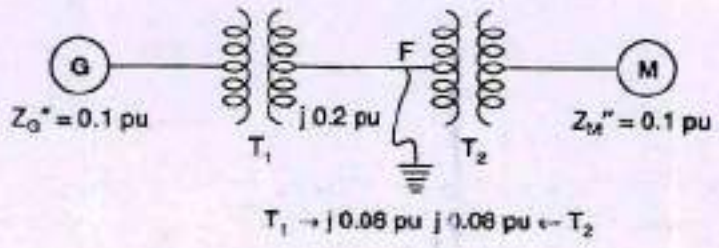
$IC_1 = 25 + 0.2\,PG_1$

$IC_2 = 32 + 0.2\,PG_2$,

where PG_1 and PG_2 are real power generated by the units. The economic allocation for a total load of 250 MW, neglecting transmission loss is given by

A) PGI = 140.25 MW, PG2 = 109.75 MW
B) PG I = 109.75 MW, PG2 = 140.25 MW
C) PGI = PG2 = 125 MW
D) PGI = 100 MW, PG2 = 150 MW.

76. The following figure shows the single line diagram of a power system with all reactances marked in per unit (pu) on the same base. The system is on no-load when a 3-phase fault occurs at 'F' on the high voltage side of the transformer T2. The fault current will be



A) – j0.8187 pu

B) + j0.8187 pu

C) – j8.1871 pu

D) + j8.1871 pu

77. A generator is connected to an infinite bus through a double circuit transmission. The fault occurring at the middle of one of the transmission lines is subsequently cleared by opening the circuit breakers at both the ends of the line simultaneously. The transient stability limit of the system is improved by

A) decreasing the excitation of generator

B) decreasing the fault-clearing time

C) increasing the fault-clearing time

D) increasing the transfer reactance between the generator and infinite bus

78. For a two-machine system with losses, with the transfer-impedance being resistive, the maximum value of the sending-end power P_{1max} and the maximum receiving-end power P_{2max} will occur at power-angles (δ) in such a manner that

A) both Plmax and P2max occur at $\delta < 90°$

B) both P lmax and P2max occur at $\delta > 90°$

C) P1 max occur at $\delta > 90°$ and P2max at $\delta < 90°$

D) P1 max occur at $\delta < 90°$ and P2max at $\delta > 90°$

79. An isolated synchronous generator with tansient reactance equal to 0.1 pu on a 100 MVA base is connected to the high voltage bus through a step up transformer of reactance 0.1pu on 100 MVA base. The fault level at the bus is

A) 1000 MVA

B) 500 MVA

C) 50 MVA

D) 80 MVA.

80. Consider the following statements regarding the fault analysis :

1. The neutral grounding impedance Zn appears as 3Zn in zero sequence equivalent circuit.
2. For faults on transmission lines, 3-phase fault is the least severe amongst other faults.
3. The positive and negative sequence networks are not affected by method of neutral grounding.

Which of the statements given above are correct?

A) 2 and 3

B) 1 and 2

C) 1 and 3

D) 1, 2 and 3

81. A synchronous generator with a synchronous reactance of 1.3 pu is connected to an infinite bus whose voltage is 1 pu, through an equivalent reactance of 0.2 pu. For maximum output of 1.2 pu, the alternator emf must be

A) 1.5 pu

B) 1.56 pu

C) 1.8 pu

D) 2.5 pu

82. The capacitance and inductance per unit length of a line operating at 110 kV are 0.01 μF and 2mH. The surge impedance loading of the line is:

A) 40 MVA

B) 30 MVA

C) 27 MVA

D) None of the above

83. If the differential and common mode gains of a differential amplifier are 50 and 0.2 respectively, then the CMRR will be:

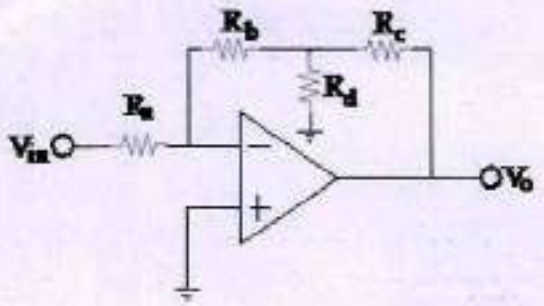
A) 10

B) 49.8

C) 50.2

D) 250

84. The transfer gain of for the circuit shown in the below figure is given by:



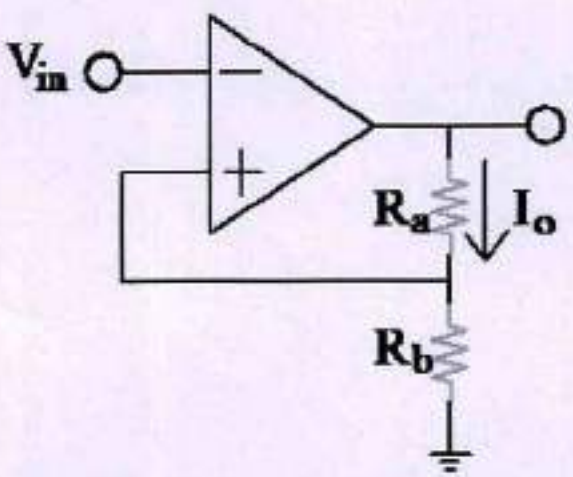
A) $-\left[\dfrac{R_a + R_c + \dfrac{R_a R_c}{R_d}}{R_a}\right]$

B) $-\left[\dfrac{\dfrac{R_c R_d}{R_c + R_d} + R_b}{R_a}\right]$

C) $-\left[\dfrac{\dfrac{R_a R_d}{R_a + R_d} + R_c}{R_a}\right]$

D) $-\left[\dfrac{\dfrac{R_c R_d}{R_c + R_d} + R_a}{R_b}\right]$

85. What is the expression of current I_o as shown in the circuit below.



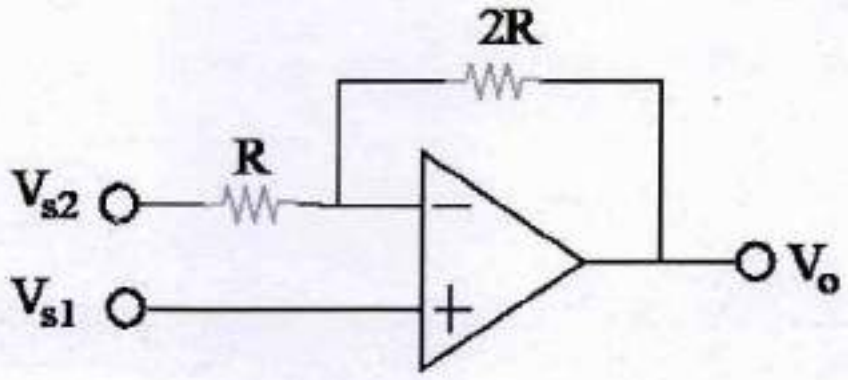
A) $\dfrac{V_{in} R_a}{R_b(R_a + R_b)}$

B) $V_{in}\left(\dfrac{1}{R_a} + \dfrac{1}{Rb}\right)$

C) $\dfrac{V_{in}}{R_a}$

D) $\dfrac{V_{in}}{R_b}$

86. The voltage V_o of the op-amp circuit shown below is:



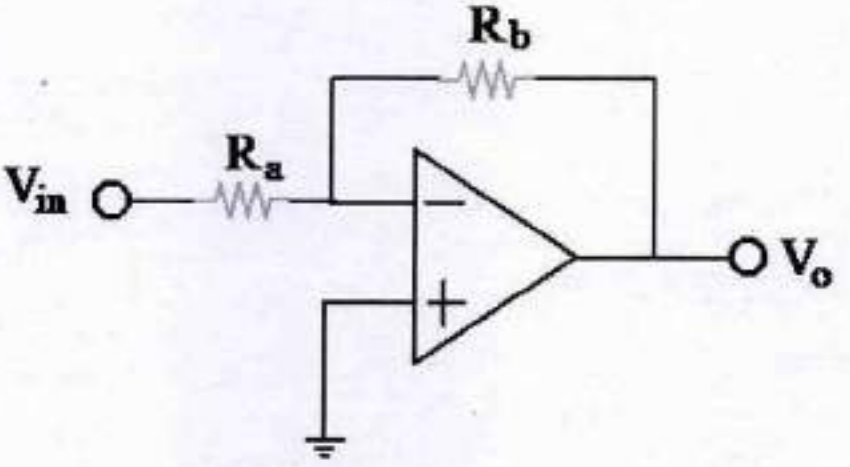
A) $3V_{s1} - 6V_{s2}$

B) $2V_{s1} - 3V_{s2}$

C) $2V_{s1} - 2V_{s2}$

D) $3V_{s1} - 2V_{s2}$

87. An operational amplifier circuit is shown in the figure below. Find the maximum value of R_a such that the voltage gain lies in between -10 and -25. Provided that $R_b = 1 M\Omega$.



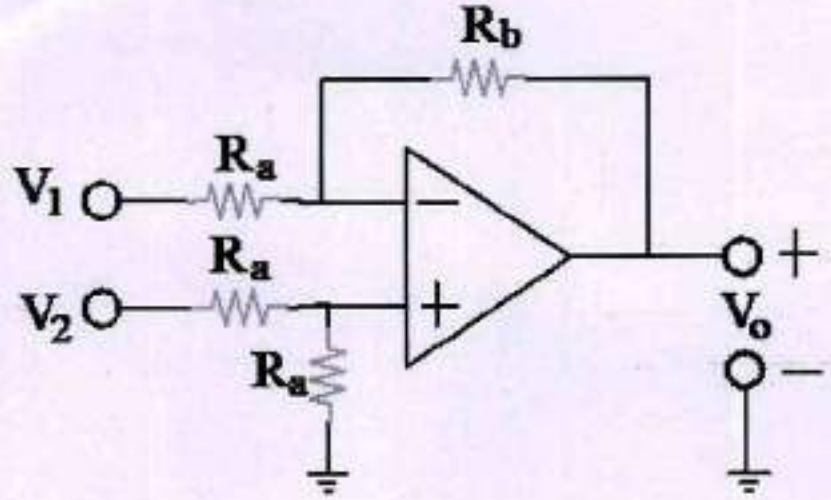
A) 100 kΩ

B) Infinity

C) 1 MΩ

D) 40 kΩ

88. What is the output voltage of the below circuit?

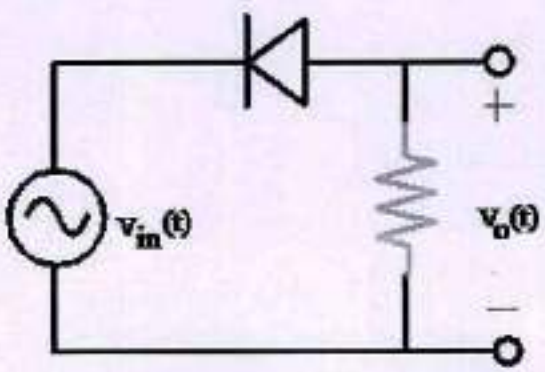


Where, R_a=50 kΩ and R_b= 250 kΩ

A) $-5V_1 + 2.5V_2$
B) $-5V_1 + 3V_2$
C) $-2.5V_1 + 2.5V_2$
D) $-2.5V_1 + 3V_2$

89. A sinusoidal waveform can be converted to a square waveform by using a
A) 2 stage transistorised overdriven amplifier.
B) 2 stage diode detector circuit.
C) Voltage comparator based on op-amp.
D) Regenerative voltage comparator circuit.

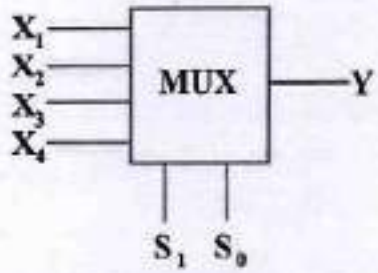
90. The average value of $V_0(t)$ of the below circuit will be:



Where, $V_{in}(t) = V_m \sin(\omega t)$

A) 0
B) $-V_m/\pi$
C) $-V_m/\sqrt{2}$
D) $-V_m$

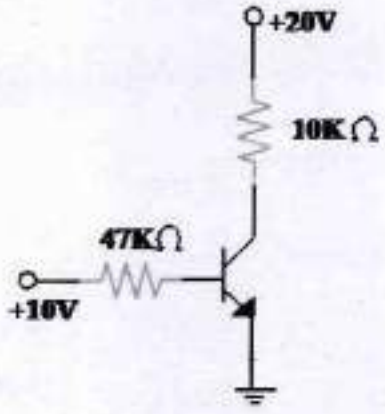
91. In the Figure shown X_1, X_2, and X_3 are HIGH; X_4 is LOW. S_1 and S_0 are control inputs.



The Multiplexer is equivalent to

A) NAND Gate
B) OR Gate
C) EXOR Gate
D) AND gate

92. In that transistor circuit as shown below the collector to ground voltage is 20 Volt. The possible condition is:



A) Collector emitter terminals shorted
B) Emitter to ground connection open
C) 10 kilo ohm resistor open
D) Collector base terminal shorted.

93. The expression $(X+Y)(X+\overline{Y})(\overline{X}+Y)$ is equivalent to:

A) $\overline{X}\,\overline{Y}$
B) XY
C) $\overline{XY}$
D) $X\overline{Y}$

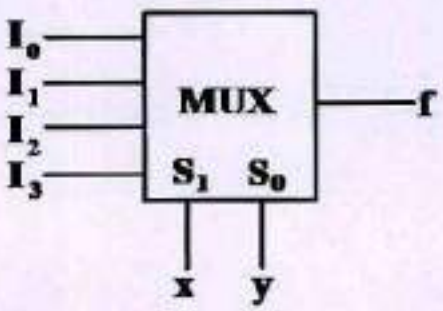
94. The function F= $A\bar{B}\bar{C}+ABC+\bar{A}BC+\bar{A}\bar{B}\bar{C}$; can be reduced to which of the following?

A) F=A
B) F=AB
C) F=B
D) F=ABC

95. Dialogic function F=(A+BC) is the simplified form of which of the following?

A) AB+BC
B) (A+B)(A+C)
C) $\overline{ABC}$
D) $\bar{A}B+A\bar{B}C$

96. Which logic inputs should be given to the input lines I_0,I_1,I_2 and I_3, if the MUX is to behave as two input XNOR gate?



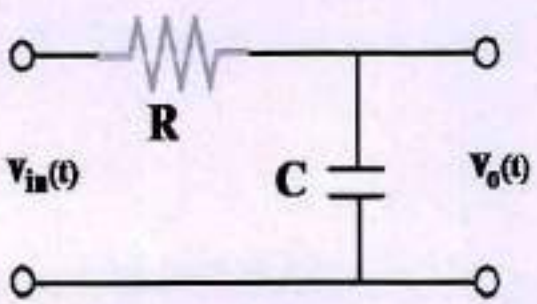
A) 0110
B) 1010
C) 1001
D) 1111

97. The transfer function $H(s)=\frac{V_0(s)}{V_i(s)}$ of an RLC circuit is given by $H(s)=\frac{10^6}{s^2+20s+10^6}$

The quality factor of the circuit is:

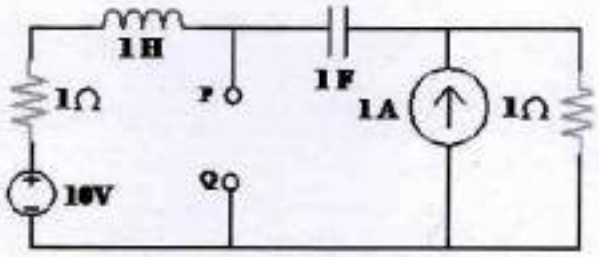
A) 25
B) 50
C) 100
D) 5000

98. For the circuit shown in the figure, the time constant RC = 1 ms. The input voltage is $v_{in}(t)=\sqrt{2}\sin(10^3t)$. The output voltage $v_0(t)$ is equal to



A) $\sin(10^3t-45^\circ)$
B) $\sin(10^3t+45^\circ)$
C) $\sqrt{2}\sin(10^3t+30^\circ)$
D) $\sqrt{2}\sin(10^3t-30^\circ)$

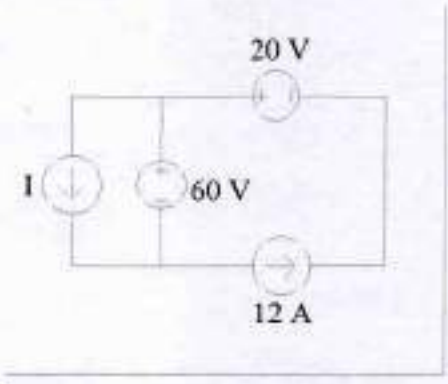
99. The Thevenin equivalent impedance Z_{th} between the nodes P and Q in the following circuit is:



A) 1 B) $2+s+\frac{1}{s}$

C) $1+s+\frac{1}{s}$ D) $\frac{s^2+s+1}{s^2+2s+1}$

100. In the interconnection of ideal sources shown in the figure, it is known that the 60 V source is absorbing power. Which of the following can be the value of the current source I?

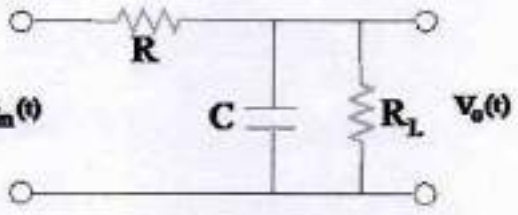


A) 10A B) 13A

C) 15A D) 18A

101. If the transfer function of the following network is:

$$\frac{V_o(s)}{V_{in}(s)} = \frac{1}{2+sRC}$$

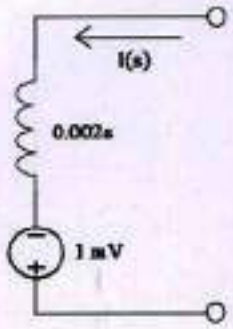


The value of the load resistance R_L is:

A) R/4 B) R/2

C) R D) 2R

102. A 2 mH inductor with some initial current can be represented as shown below, where s is the Laplace Transform variable. The value of initial current is.



A) 0.5A
B) 1.0A
C) 2.0A
D) 2.5A

103. An SCR is turned off by
A) Reducing anode voltage to zero
B) Removing gate signal
C) Reverse biasing the gate
D) All the above

104. The electrolytic rectifier operates on the principle that an aluminium electrode in an electrolyte will only conduct when it is charged.
A) negatively
B) positively
C) neutral
D) none of the above

105. Which of the following can work dual side wave shape clipping
A) Diode
B) Triode
C) Triac
D) FACTS

106. Which among the following is an example of a voltage bidirectional two-quadrant switch?
A) SCR
B) BJT
C) Diode
D) MOSFET

107. In a three-phase (50Hz) full converter, the ripple frequency in output voltage?
A) 50 Hz
B) 100 Hz
C) 150 Hz
D) 300 Hz

108. A silicon-controlled rectifier is turned on if the anode current is greater than

A) Trigger current
B) Anode current
C) Cathode current
D) Holding current

109. The TRIAC is the same as

A) Two SCR connected in parallel
B) Two SCR connected in antiparallel
C) One SCR and one thyristor connected in parallel
D) Two SCR connected in series

110. Which of the given devices is the most suitable power device for a higher frequency (above 100 kHz) switching application

A) SCR
B) Power MOSFET
C) GTO
D) BJT

111. Which of the given motors has insufficient starting torque at full load speed with the same H.P. ratings?

A) Three-phase Induction motor
B) Shunt motor
C) Synchronous motor
D) Differential compound motor

112. In a synchronous machine, the V curve is drawn between which of the given axes.

A) Field current on X-axis and no-load current on Y-axis
B) Armature current on X-axis and no-load current on Y-axis
C) Field current on X-axis and armature current on Y-axis
D) Armature current on X-axis and field current on Y-axis

113. In a 3-ϕ induction motor, the starting current is 8 times the rated current, and the rated slip is 6 %, then find the ratio of starting torque to full load torque.

A) 1
B) 1.5
C) 1.75
D) 2

114. The primary reason for a D.C. motor Prefer ed over an A.C. motor
- A) Constant speed operation
- B) High-speed operation
- C) Variable speed operation
- D) Low-speed operation

115. If the frequency at the primary supply is varied gradually, then the secondary terminal voltage will _____
- A) not change
- B) vary directly
- C) vary oppositely
- D) vary inversely with frequency

116. The electromagnetic torque in non-salient pole machines depends on _____
- A) number of poles
- B) machine dimensions at the air gap
- C) peak value of stator and rotor MMF
- D) any of the mentioned

117. In practice, electromagnetic torque acting on the stator _____
- A) rotate in opposite direction to the rotor
- B) is transmitted to the ground
- C) makes it rotate in the same direction as the rotor
- D) none of the mentioned

118. In the design of electromagnetic devices, the maximum value of MMF is limited from the considerations of _____
- A) temperature rise
- B) limitation on flux density in teeth
- C) torque production rise
- D) power rating

119. CRGO Laminations in a transformer are used to minimize _____
- A) eddy current loss
- B) hysteresis loss
- C) both eddy current and hysteresis loss
- D) ohmic loss

120. If an unbalanced supply is fed to an induction motor, it will cause excessive heating of _____
- A) rotor
- B) stator
- C) rotor shaft
- D) all the mentioned

ROUGH WORK

ROUGH WORK

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

Booklet Serial No. 210005

Test Booklet Series

TEST BOOKLET
ASSISTANT PROFESSOR ELECTRONICS AND COMMUNICATION ENGINEERING

A

Written Test - 2023
(10)

Time Allowed: Two Hours ***Maximum Marks: 120***

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET *DOES NOT* HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT* write *anything else*** on the Test Booklet.
4. This Test booklet contains 120 items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose *ONLY ONE* response for each item.
5. You have to mark all your responses *ONLY* on the separate Answer /Response Sheet provided. *See directions in the Response Sheet.*
6. *All* items carry equal marks.
7. Before you proceed to mark in the Answer /Response Sheet, the response to various items in the Test Booklet, you have to fill in some particulars in the Answer /Response Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator *only the Answer /Response Sheet*. You are permitted to take away with you the Test Booklet and *Candidate's Copy of the Response Sheet*.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. While writing Centre, Subject and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN"**.
11. **Penalty for wrong answers:**

THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).

(i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, (0.25) of the marks assigned to that question will be deducted as penalty.

(ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.

(iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

(10) (A)

1. Choose the correct product of sum (POS) form of the Karnaugh map shown below by grouping the zeros.

	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0	0	1	0
$\bar{A}B$	0	0	1	1
AB	x	x	x	1
$A\bar{B}$	x	x	x	0

A) $Y = C(\bar{A} + B)$ B) $Y = B(A + C)$

C) $Y = C(B + \bar{D})$ D) $Y = C(B + D)$

2. Choose the correct binary equivalent of decimal 363
   A) 101101011
   B) 011110100
   C) 101001001
   D) 1011101011

3. Choose the correct hexadecimal representation of binary 65,535
   A) FDFD
   B) FFFF
   C) FCFF
   D) FFEF

4. Flip-Flops are
   A) Monostable memory device
   B) Monostable device without memory
   C) Bistable memory device
   D) All of the above

5. Choose the correct forbidden state for R-S flip-flop
   A) R = 0, S = 0
   B) R = 1,S = 1
   C) R = 1,S = 0
   D) None of the above

6. Choose the false statement considering flip-flops
   A) JK can be converted to T
   B) JK can be converted to RS
   C) JK can be converted in to D
   D) None of the above statement are true

7. How long will it take to shift 8-bit number into a 54164 shift register if the clock is set at 10 MHz?
   A) 750 ns
   B) 850 ns
   C) 700 ns
   D) 800 ns

8. Suppose a counter is preset to 1001 (the number 9), but clock is applied to count 'down' rather than count 'up'. What are the counting state and modulus?
   A) 15 and 15
   B) 15 and 10
   C) 10 and 5
   D) 9 and 15 respectively

9. Minimum number of JK flip-flop required to design a modulo-6 counter
   A) 4
   B) 2
   C) 3
   D) 5

10. Choose the current statement which defines Moore model for sequential circuit design
   A) The output depends only on present state and not on input
   B) The output depends only on present state as well as on input
   C) The output depends only on present state and previous state
   D) The output depends only on input

11. Choose the current statement which defines Mealy model for sequential circuit design
   A) The output depends on present state and not on input
   B) The output depends on present state as well as on input
   C) The output depends only on present state and previous state
   D) The output depends only on input

12. The condition which leads to two different outputs of the circuit depending on which feedback variable changes earlier is called as:
   A) Race around condition
   B) Critical Race condition
   C) Synchronous race condition
   D) Sequential race condition

13. Just inside the surface of a dielectric slab the electric field is 10 v/m and makes an angle of 60° with the surface. If dielectric constant of the slab is 4, the approximate electric field in v/m and its angular direction just above the surface will be
   A) 18 V and 73.9°
   B) 25 V and 69.9°
   C) 15V and 56.9°
   D) 20V and 50.9°

14. Identify the correct boundary condition for Dielectric-Dielectric interface
    A) $E_{t} = E_{n2}$
    B) $D_{n1} = P$
    C) $B_{n1} = B_{n2}$
    D) $H_{t} = H_{n2}$

15. Just outside a train compartment the field strength of a radio station is 0.1 v/m. What will be the approximate field strength inside the compartment? Assume the compartment to be a closed box of metal having conductivity 5×10^{6} mho/m. The thickness of the compartment wall is 5mm. Frequency of radio station is 600 KHz.
    A) 3.4×10^{-9} v/m
    B) 3.4×10^{-7} v/m
    C) 5.4×10^{-9} v/m
    D) 5.4×10^{-7} v/m

16. The preferred polarization for satellite communication is
    A) Linear
    B) Elliptical
    C) Circular
    D) Spatial

17. What happen to speed of an EM wave in a homogeneous dielectric medium compared to that in vacuum?
    A) It increases
    B) It increases and decreases halfway
    C) It decreases
    D) It remains same

18. What is the dominant mode for a rectangular waveguide?
    A) TE_{10}
    B) TM_{10}
    C) TE_{01}
    D) TM_{01}

19. Standing wave ratio is the ratio of _____ of a standing wave.
    A) Maximum and minimum energy
    B) Maximum and minimum power
    C) Maximum and minimum voltage
    D) All of the above

20. The angle of incident for which there is no reflection is known as
    A) Reflected angle
    B) Critical angle
    C) Angle of total internal reflection
    D) Brewster angle

21. Compared to dipole antenna, gain and directivity of the monopole antenna is

A) Less than dipole antenna

B) Higher than dipole antenna

C) Equal to dipole antenna

D) Half of the dipole antenna

22. For Elliptical polarization the angle between two components of Electric field is

A) 45°

B) 60°

C) 90°

D) 180°

23. Consider an indoor wireless LAN with fc = 900 MHz, cells of radius 100 m, and nondirectional antennas. Under the free-space path loss model,what transmit power is required at the access point such that all terminals within the cell receive a minimum power of 10 μW.

A) 1.6dBW

B) 2.6dBW

C) 0.6 dBW

D) 3.6 dBW

24. Consider a channel with Rayleigh fading and average received power Pr = 20 dBm. Find the probability that the received power is below 10 dBm.

A) 1.25

B) 0.05

C) 1.5

D) 0.095

25. Consider a voice system with acceptable BER when the received signal power is at or above half its average value . If the BER is below its acceptable level for more than 120 ms, users will turn off their phone. Find the range of Doppler values in a Rayleigh fading channel such that the average time duration when users have unacceptable voice quality is less than t = 60 ms.

A) 2 Hz

B) 4.5 Hz

C) 6 Hz

D) 8 Hz

26. For a channel with Doppler spread Bd = 80 Hz, what time separation is required in samples of the received signal such that the samples are approximately independent.

A) 11ms

B) 10.5ms

C) 12.5ms

D) 9 ms

27. For $g(t) = v(2/Ts)$, $0 \le t < T_s$ a rectangular pulse shape, find the average energy of 4PAM modulation.

A) $5d^2$

B) $6d^2$

C) $7d^2$

D) $8d^2$

28. If A and B are complex matrices, k is a complex number with 'k as its complex conjugate, and '*' represent conjugate transpose then which of the following properties is not true.

A) $(A^*)^* = A$

B) $(A + B)^* = A^* + B^*$

C) $(kA)^* = k^*A^*$

D) $(AB)^* = B^*A^*$

29. A complex matrix A is called unitary if

A) $A = A^*$

B) $A = A^{-1}$

C) $A^* = A^{-1}$

D) $A^{-1} = (A^*)^*$

30. Square matrix 'A' is Hermitian if

A) $A = A^{-T}$

B) $A = A^{-1}$

C) $A = A^*$

D) None of the above

31. If A is a Hermitian matrix, then its eigan-values are:
    A) Complex numbers
    B) Zero
    C) Imaginary numbers
    D) Real numbers

32. The reflection coefficient for a transmission line is calculated using load (Z_L) and characteristics impedance (Z_0) as:
    A) $(Z_L - Z_0)/(Z_L + Z_0)$
    B) $(Z_0)/(Z_L + Z_0)$
    C) $(Z_L)/(Z_L + Z_0)$
    D) $(Z_L + Z_0)/(Z_L - Z_0)$

33. Rectangular Waveguides are :
    A) Double conductor device
    B) Single conductor device
    C) Multilayered conductor device
    D) Device made of both conductor and dielectric.

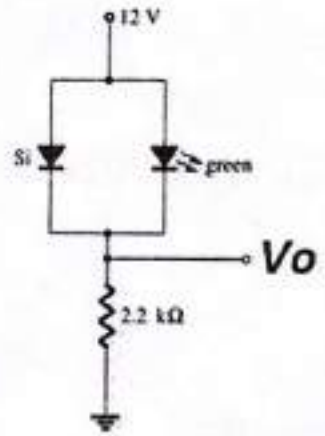
34. Consider an inverting amplifier configuration with $R_1 = 1k\Omega$, $R_2 = 100\ k\Omega$, and $A = 10^3$. The close loop gain for this amplifier will be:
    A) 90.83
    B) 91.83
    C) 94.8
    D) 97.9

35. Find the resistivity of an intrinsic silicon with. $N_A = 10^{16}\ cm^3$, $Ni = 1.5 \times 10^{10}\ /cm^3$ and assume that the $\mu_n = 1350\ cm^2/V$ and $\mu_p = 480\ cm^2/V$
    A) $1.5 \times 10^5\ \Omega.cm$
    B) $1.38 \times 10^5\ \Omega.cm$
    C) $2.28 \times 10^3\ \Omega.cm$
    D) $2.28 \times 10^5\ \Omega.cm$

36. The forward resistance of the diode is usually _____ compared to the other series elements of the network.
    A) Similar
    B) Double
    C) Small
    D) Very high

37. For a Gallium Arsenide based diode the value of V_D must be greater than:
    A) 0.7 V
    B) 0.25V
    C) 1.5V
    D) 1.2 V

38. Determine Vo in the given circuit.



A) 12.3 V
B) 12.5 V
C) 11.3 V
D) 11.5 V

39. The most suitable diode used for voltage regulation is
A) Varactor Diode
B) PIN diode
C) Zener Diode
D) Thyristor

40. To maintain a relatively low transformer peak voltage while stepping up the peak output voltage to two, three, four, or more times the peak rectified voltage, the device used is:
A) Voltage adder
B) Voltage doubler
C) Voltage invertor
D) Voltage multiplier.

41. Field effective transistor (FET) is known to have.
A) Poor Voltage gain and High input impedance
B) Poor voltage gain and low input impedance
C) Excellent voltage gain and low input impedance
D) Excellent voltage gain and high input impedance

42. The _____ controls the drain-to-source (channel) current of a JFET.
A) Gate-to-source voltage
B) Gate-to-drain voltage
C) Source to drain voltage
D) Source to gate voltage

43. For a JFET the maximum value of g_m occurs where V_{GS} = _____ V
A) Infinity
B) 0V
C) 0.7V
D) 0.47V

44. The input impedance for commercially available JFET is
A) 50Ω
B) 0 Ω
C) Infinity
D) 377Ω

45. For a n-channel JFET the maximum current I_{DSS} happens when
A) $V_{GS} = 0$ V and $V_{DS} = V_P$
B) $V_{GS} = 0$ V and $V_{DS} = 1/2\ V_P$
C) $V_{GS} = 0$ V and $V_{DS} = 0$
D) $V_{GS} = 0$ V and $V_{DS} = -V_P$

46. Difference between the measured value and the true value of the 'quantity' is know as _____
A) Dynamic error
B) Progressive error
C) Static error
D) Decremental error

47. A thermometer is calibrated 150° C to 200° C. The accuracy is specified within ± 0.25 percent. What is the maximum static error
A) 0.125°C
B) 0.120°C
C) 0.115°C
D) 110°C

48. A-Wheatstone bridge requires a change of 7Ω in the unknown arm of the bridge to produce a charge in deflection of 3 mm of the galvanometer, sensitivity will be:
A) 0.33 mm/ Ω
B) 0.43mm/ Ω
C) 0.35mm/ Ω
D) 0.25mm/ Ω

49. A digital voltmeter has a read-out rang from 0 to 9,999 counts. Determine the resolution of the instrument in volt when the full-scale reading is 9·999 V
A) 4mV
B) 3mV
C) 2mV
D) 1mV

50. The incapability of the system to faithfully measure, record, or control the input signal (measurand) in undistorted form is called _____

A) Fidelity error
B) Race-around effect
C) Loading effect
D) Break-down error

51. A multi-meter having a sensitivity of 2,000 Ω /V is used to measure the voltage across a circuit having an output resistance of 10 k Ω.. The open circuit voltage of the circuit is 6 V. Find the reading of the multi- meter when it is set to its 10 V scale. Find the percentage error.

A) 4V and -33%
B) 2V and -33%
C) 4V and -44%
D) 2V and -44%

52. A voltage source has an open circuit voltage of 20 V and has an output impedance of 0.5 + j10. The voltage source is connected to the load through a transmission network having an impedance of 1.5 + j40. At what load will maximum power transfer be realized?

A) $z_L = 3\text{-}j\ 6\Omega$
B) $z_L = 2\text{-}j\ 5\Omega$
C) $z_L = 4\text{-}j\ 8\Omega$
D) $z_L = 5\text{-}j\ 5\Omega$

53. The resistance of a circuit is found by measuring current flowing and the power fed into the circuit. Find the limiting error in the measurement of resistance when the limiting errors in the measurement of power and current are respectively ± 1.5% and ± 1.0%.

A) ± 1.5%
B) ± 2%
C) ± 2.5%
D) 3.5%

54. A resistance is rated at 3200 Ω and the current flowing through it is 64 mA. (a), Compute the power loss in the resistor. (b) It was later found that the resistance of the resistor was 0.2 percent greater than the specified resistance and the ammeter read 0·75 percent more than the true current. Determine the known error in the computed power in part (a).

A) 13.1W and 1.7%
B) 14.1W and 2%
C) 15.1W and 2.7%
D) 16.1W and 3%

55. A highly sensitive galvanometer can detect a current as low as 0.1nA. This galvanometer is used in a Wheatstone bridge as a detector. Each arm of the bridge has a resistance of 1k Ω. The input voltage applied to the bridge is 20 V. Calculate the smallest change in resistance which can be detected. The resistance (ΔR) of the galvanometer can be neglected as compared with the internal resistance of bridge.
A) 10μ Ω
B) 20 μ Ω
C) 30 μ Ω
D) 40 μ Ω

56. During the measurement of a low. resistance using a potentiometer the following readings were obtained : voltage drop across the low resistance under test: 0.422 V, voltage drop cross a 0.1Ω standard resistance = 1.0235 V. Calculate the value of unknown resistance,
A) 0.0413 Ω
B) 0.0322 Ω
C) 0.0234 Ω
D) 0.0154 Ω

57. A potentiometer that is accurate to ±0.0001 V (Standard Deviation) is used to measure current through a standard resistance of 0.1 ± 0.1 % {Standard Deviation). The voltage across the resistance is measured to be 0.251V. What is the approx. current?
A) 1.8A
B) 3.7A
C) 2.5A
D) 4.5A

58. A potential divider is designed to have large numbers of turns, such that
A) Smooth variation in current is obtained
B) Smooth variation in impedance is obtained
C) Smooth variation in Voltage is obtained
D) Smooth Variation in power is obtained

59. The constant of a given magnetic potentiometer is obtained by aid of a coil of 300 turns in which a current of 0.6A is reversed. The resulting throw of the galvanometer is 157 scale divisions. It is then used to measure the magnetic potential difference between two points and the throw is 304 divisions. Find the magnetic potential difference.
A) 550A
B) 750A
C) 695A
D) 500A

60. A minimum all day efficiency of a general transformer is
A) 90%
B) 80%
C) 70%
D) 60%

61. Let xl and x2 be (continuous) periodic functions with periods Tl and T2, respectively. Then, the function x = xl +x2 is a periodic if and only if
   A) Ration of Tl/T2 is a complex number
   B) Ration of Tl/T2 is a imaginary number
   C) Ration of Tl/T2 is a real number
   D) Ration of Tl/T2 is a rational number

62. Let xl(t) = sin(πt) and x2(t) = sin(t). Determine whether the function y = xl +x2 is
   A) Periodic
   B) It's a-periodic
   C) Conditional periodic
   D) Conditional a-periodic

63. Let xl(t) = cos(2πt + π4) and x2(t) = sin(7πt). The fundamental period of y = xl +x2 is:
   A) 4
   B) 3
   C) 2
   D) 1

64. A function x is said to be bounded if there exists some (finite) nonnegative real constant A such that:
   A) $|x(t)| \leq A$ for all t
   B) $|x(t)| \geq A$ for all t
   C) $|x(t)| = A$ for all t
   D) $|x(t)| > A$ for all t

65. The unit-step function (also known as the Heaviside function) is denoted as u and defined as
   A) u(t) = infinity for t > 0, u(t) = 0 otherwise
   B) u(t) = 0 for t > 0, u(t) =1 otherwise
   C) u(t) = 1 for t < 0, u(t) = 0 otherwise
   D) u(t) = 1 for $t \geq 0$, u(t) = 0 otherwise

66. The unit-impulse function (also known as Dirac delta function or delta function) is denoted as δ and defined as the function with the following two properties.
   A) δ(t) = 1 for $t \neq 0$ and Integral of δ(t) with respect to elemental time within limits -infinity to + infinity =1
   B) δ(t) = 0 for $t \neq 0$ and Integral of δ(t) with respect to elemental time within limits -infinity to +infinity = 0.
   C) δ(t) = 1 for $t \neq 0$ and Integral of δ(t) with respect to elemental time within limits -infinity to +infinity = 0
   D) δ(t) = 0 for $t \neq 0$ and Integral of δ(t) with respect to elemental time within limits -infinity to + infinity =1

67. The equivalence property is represented as

A) $x(t)\delta(t + t_0) = x(t_0)\delta(t - t_0)$ for all t

B) $x(t)\delta(t - t_0) = x(t_0)\delta(t - t_0)$ for all t

C) $x(t)\delta(t - t_0) = x(t_0)\delta(t + t_0)$ for all t

D) $x(t) - \delta(t - t_0) = x(t_0) + \delta(t - t_0)$ for all t

68. Evaluate given integral using appropriate properties related to signals.

$$\int_{-\infty}^{\infty} \sin(t)\delta\left(t - \frac{\pi}{4}\right) dt$$

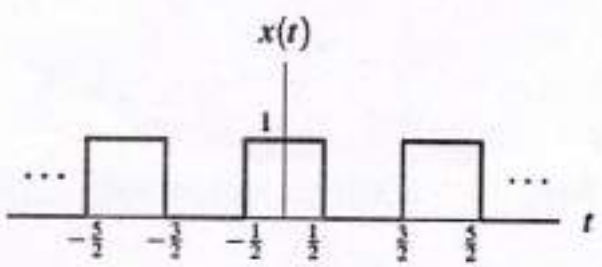
A) 1

B) $1/\sqrt{2}$

C) $1/\sqrt{4}$

D) $2/\sqrt{2}$

69. Consider the periodic function x shown below. Find a single expression for x(t) (involving unit-step functions) that is valid for all t



A) $\sum_{K=-\infty}^{\infty} [u(t + 1/2 - 2k) - u(t - 1/2 - 2k)]$

B) $\sum_{K=-\infty}^{\infty} [u(t - 1/2 + 2k) - u(t - 1/2 - 2k)]$

C) $\sum_{K=0}^{\infty} [u(t + 1/2 - 2k) - u(t - 1/2 - 2k)]$

D) $\sum_{K=-\infty}^{\infty} [u(t + 1/2 - 2k) + u(t - 1/2 + 2k)]$

70. System H is defined using below four system expression, identify which of these system expressions is 'not memory less'

1. $Hx(t) = Ax(t)$
2. $Hx(t) = \int_{-\infty}^{t} x(\tau)d\tau$
3. $Hx(t) = e^{x(t)}$
4. $Hx(t) = Odd(x)(t) = 1/2[x(t) - x(-t)]$

A) 1
B) 2
C) 3
D) 4

71. System is such that the value of its output at any given point in time can depend on the value of its input at only the same or earlier points in time (i.e., not later points in time), such system is known as :

A) Linear system
B) Non-linear system
C) Casual system
D) Non-casual system

72. Correct expression for time invariant system is :

A) $Hx(t - t_0) = Hx'(t)$ for all t where $x'(t) = x(t - t_0)$
B) $Hx(t + t_0) = Hx'(t)$ for all t where $x'(t) \neq x(t - t_0)$
C) $Hx(t - t_1) = Hx'(t)$ for all t where $x'(t) = x(t + t_0)$
D) $Hx(t - t_0) = Hx'(t)$ for all t where $x'(t) \neq x(t - t_0)$

73. Consider the system H characterized by the equation $Hx(t) = D^2 x(t)$ where D denotes the derivative operator. For function $x(t) = \cos(2t)$ determine if x is an eigenfunction of H, and if it is, find the corresponding eigenvalue.

A) x is not the eigen function of H
B) x is the eigen function of H, eigen value = -4
C) x is the eigen function of H, eigen value = -2
D) x is the eigen function of H, eigen value = -6

74. In the given property which is not the property of convolution

A) Commutative
B) Associative
C) Distributive
D) Reciprocity

75. The periodic convolution of the T-periodic functions x and h, denoted by x (periodic convolution) h, is defined as

A) $x \otimes h(t) = \int_T x(\tau)h(t+\tau)d\tau$

B) $x \otimes h(t) = \int_T x(-\tau)h(t-\tau)d\tau$

C) $x \otimes h(t) = \int_T x(\tau)h(t-\tau)d\tau$

D) $x \otimes h(t) = \int_T x(\tau)h(t-\tau)dt$

76. A LTI system with impulse response h is memoryless if and only if
A) $h(t) = 0$ for all $t = 0$
B) $h(t) \neq 0$ for all $t \neq 0$
C) $h(t) \neq 0$ for all $t = 0$
D) $h(t) = 0$ for all $t \neq 0$

77. A LTI system with impulse response h is causal if and only if
A) $h(t) = 0$ for all $t > 0$
B) $h(t) = 0$ for all $t < 0$
C) $h(t) \neq 0$ for all $t < 0$
D) $h(t) < 0$ for all $t < 0$

78. If x is a periodic function satisfying the Dirichlet conditions, then:
A) The Fourier series converges pointwise everywhere to x, except at the points of discontinuity of x
B) The Fourier series converges discreetly everywhere to x, except at the points of discontinuity of x
C) The Fourier series converges pointwise everywhere to x, except at the points of continuity of x
D) The Fourier series converges randomly everywhere to x, for all points of discontinuity of x

79. For a T -periodic function x with Fourier series coefficient sequence c, the following properties hold:
A) x is even if and only if c is even; and x is odd if and only if c is odd.
B) x is odd if and only if c is even; and x is even if and only if c is odd.
C) x is even if and only if c is 0; and x is even if and only if c is odd.
D) x is even if and only if c is even; and x is even if and only if c is odd.

80. A first order low pass filter will have capacitor in

A) Series

B) Shunt

C) Both in series as well as in shunt

D) None of the above

81. Consider the function x(t) = sinc (1/2 t) , which has the Fourier transform X given by $X(\omega) = 2\pi$ rect ω. Energy of x is given by :

A) 4π

B) 3π

C) 2π

D) π

82. Consider initial and final value theorem: A causal sequence x with a (well-defined) limit at ∞ has the z transform:

$$X(z) = \frac{4z^2 - 3z}{2z^2 - 3z + 1}$$

The value of x(0) will be:

A) 4

B) 3

C) 2

D) 1

83. LTI system with system function H is causal if and only if the Region Of Convergence of H is:

A) The exterior of a circle, including ∞

B) The entire complex plane, including 0 and possibly excluding ∞

C) Both A and B

D) None of the above

84. the ratio of the Laplace transform of the output Y(s) to the Laplace transform of the corresponding input U(s) is know as

A) transfer function of a nonlinear, time-invariant system

B) transfer function of a dynamic, time-variant system

C) transfer function of a linear, time-variant system

D) transfer function of a linear, time-invariant system

85. The Laplace Transform of the function f(t) is defined as

A) $L\{f(t)\} = \int_0^\infty f(t)e^{st}dt$

B) $L\{f(t)\} = \int_0^\infty f(s)e^{-st}ds$

C) $L\{f(s)\} = \int_0^\infty f(s)e^{-s}dt$

D) $L\{f(t)\} = \int_0^\infty f(t)e^{-st}dt$

86. The Laplace Transform of $f(t) = e^{-at}$, $t \geq 0$, where $a \in R$ will be $1/(s+a)$ if real part of $(s+a)$ is

A) Re $(s+a) > 0$
B) Re $(s-a) > 0$
C) Re $(s+a) < 0$
D) Re $(s+a) = 0$

87. Laplace Transform of $\delta(t)$

A) 1
B) e^0
C) Both A and B
D) None of the above

88. Inverse laplace transform of $1/s(s+1)$ is

A) $1(t) - e^t$
B) $1(t) - e^{-t}$
C) $1(\omega) - e^t$
D) $1(t) + e^t$

89. The frequency response of an element or system is:

A) A measure of its dynamic performance under conditions of sinusoidal excitation.
B) A measure of its steady-state performance under conditions of sinusoidal excitation.
C) A measure of its transient-state performance under conditions of sinusoidal excitation .
D) A measure of its steady-state performance under conditions of a-periodic excitation.

90. Poles for a fourth order Butterworth filter will lie in _____ quadrant of complex plane.

A) 1st and 2nd
B) 1st and 4th
C) 2nd and 3rd
D) 3rd and 4th

91. An n -type material is created by introducing impurity elements that have _____ valence electrons.
A) 4
B) 3
C) 2
D) 5

92. The maximum reverse-bias potential that can be applied before entering the breakdown region is called
A) Peak saturation voltage
B) Peak static voltage
C) Peak inverse voltage
D) Peak dynamic voltage

93. Among Ge, Si and GaAs the knee voltage is highest for
A) Ge
B) Si
C) GaAs
D) All of them have same knee voltage

94. In the reverse-bias region the reverse current of a silicon diode _____ for every 10°C rise in temperature
A) Increases by half
B) Increase by two times
C) Increase by three times
D) Increase by four times

95. The _____ is the predominant capacitive effect in the reverse-bias region
A) Diffusion capacitance
B) Saturation capacitance
C) Transition capacitance
D) Biased Capacitance

96. The _____ is the predominant capacitive effect in the forward-biased region
A) Diffusion capacitance
B) Saturation capacitance
C) Transition capacitance
D) Biased Capacitance.

97. Consider the statement "The light intensity of an LED will increase with forward current until a point of saturation arrives where any further increase in current will not effectively increase the level of illumination", is this statement
A) True
B) False
C) True only for LED made of Si
D) True only for LED made of Ge

98. The reversed biased breakdown voltage for LED is between
A) 1V to 3 V
B) 3V to 5V
C) 5V to 7 V
D) None of the above

99. In the cut off region for a BJT the base-emitter and collector-base junctions of a transistor are
A) Both forwards biased
B) One is forward biased, and another is reversed biased
C) Both reverse biased
D) Remain ineffective.

100. In the saturation region for a BJT the base-emitter and collector-base junctions of a transistor are
A) Both forwards biased
B) One is forward biased, and another is reversed biased
C) Both reverse biased
D) Remain ineffective

101. In a CE based BJT circuit for linear amplification purposes, cutoff for the common-emitter configuration will be defined by :
A) $I_C = I_E$
B) $I_C = I_{CBO}$
C) $I_C = I_B$
D) $I_C = I_{CEO}$

102. JFET Transistor as a device is controlled by
A) Current
B) voltage
C) First current and then voltage
D) None of the above

103. In terms of temperature stability
A) FET is more stable than BJT
B) BJT is more stable than FET
C) Both BJT and FET are equally stable
D) Both BJT and FET are equally unstable.

104. In FET the pinch off occurs due to increase in
A) V_{GS}
B) V_{GD}
C) V_{DS}
D) None of the above

105. The controlling voltage for JFET is

A) V_{DS}
B) V_{GD}
C) V_{GS}
D) V_{DD}

106. "For an automatic gain control system JFET can be employed as a variable resistor whose resistance is controlled by the applied gate-to source voltage" this statement is

A) True
B) False
C) Ture for high V_{GS}
D) False for high value of V_{DS}

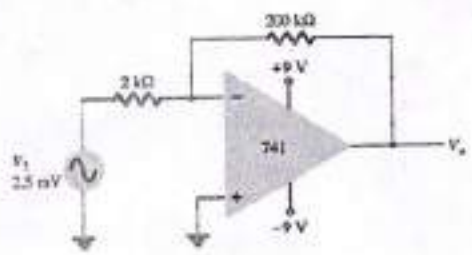
107. The high input impedance of the MOSFET is due :

A) Distance between gate, source and drain terminals
B) The high values of control voltages
C) The insulting layer of SiO_2 used
D) None of the above

108. For double-ended operation in an Operational amplifier

A) Inverting terminal is grounded, and voltage is applied to non-inverting terminal
B) Non-inverting terminal is grounded, and voltage is applied to inverting terminal
C) Both inverting and non-inverting terminals are supplied with voltages
D) The non-inverting terminal is connected to output

109. Vo for the given circuit is



A) -0.5V
B) -0.25V
C) -0. 15V
D) -0.1V

110. Multipath fading in wireless communication system can be mitigated using _____ :

A) SISO Communication system
B) MIMO Communication system
C) MISO Communication system
D) SIMO Communication system

111. In optical fibre cable to confine the optical signal in the core, the refractive index of the core must be _____ than that of the cladding

A) Same
B) Smaller
C) Partially smaller and partially greater
D) Greater

112. The Language preferred for IoT applications

A) HTML
B) Java
C) C++
D) Python

113. Which of the following is not an loT device

A) Tablet
B) Laptop
C) Smart watch
D) Analog watch

114. For an IoT system, one of the following is not a fundamental part

A) Transformer
B) Sensor
C) Router
D) User Interface

115. The Architecture used for VLSI fabrication technology is:

A) System on board
B) System on chip
C) System on circuit
D) Simulated system

116. The type of memory suitable for embedded systems

A) ROM
B) RAM
C) Volatile
D) Non -volatile

117. The example for Micro-processor

A) Motoroloa 68000
B) Intel 4004
C) TMS 1000
D) All of the above.

118. Function of a compiler are

A) Debugging
B) Code-optimizing
C) Phrasing
D) Both A and B

119. For radar application the preferred antennas are

A) Parabolic reflector antenna
B) Helical antenna
C) Horn antenna
D) Dipole antenna

120. A Horn antenna can achieve radiation efficiency of

A) Upto 90%
B) Up to 60%
C) Up to 70%
D) Up to 80%

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

Booklet Serial No. 208321

Test Booklet Series

A

TEST BOOKLET
ASSISTANT PROFESSOR
MATHEMATICS
Written Test - 2023
(02)

Time Allowed: Two Hours *Maximum Marks: 120*

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC, IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT*** **write** ***anything else*** on the Test Booklet.
4. This Test booklet contains **120** items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer /Response Sheet provided. *See directions in the Response Sheet.*
6. ***All*** items carry equal marks.
7. Before you proceed to mark in the Answer /Response Sheet, the response to various items in the Test Booklet, you have to fill in some particulars in the Answer /Response Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer /Response Sheet.*** You are permitted to take away with you the Test Booklet and ***Candidate's Copy of the Response Sheet .***
9. Sheets for rough work are appended in the Test Booklet at the end.
10. While writing Centre, Subject and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN".**
11. **Penalty for wrong answers:**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).

    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **(0.25)** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

1. The number of positive divisors of the number $1176=2^3\times3\times7^2$ are :

A) 6

B) 12

C) 5

D) 24

2. The values of the Legendre symbols $\left(\frac{-1}{13}\right)$ and $\left(\frac{-1}{7}\right)$ are :

A) $\left(\frac{-1}{13}\right)=1,\left(\frac{-1}{7}\right)=1$

B) $\left(\frac{-1}{13}\right)=-1,\left(\frac{-1}{7}\right)=-1$

C) $\left(\frac{-1}{13}\right)=1,\left(\frac{-1}{7}\right)=-1$

D) $\left(\frac{-1}{13}\right)=-1,\left(\frac{-1}{7}\right)=1$

3. Let μ denote the Mobius function. The value of $\mu(39)$ is :

A) 0

B) 1

C) -1

D) -2

4. Let φ denotes the Euler's phi function. Then the value of $\varphi(50)$ is :

A) 20

B) 40

C) 25

D) 10

5. Which of the following congruence has a solution?

A) $x^2 \equiv 3 (\text{mod } 43)$

B) $x^2 = 5 (\text{mod } 43)$

C) $x^2 \equiv 7 (\text{mod } 43)$

D) $x^2 = 13 (\text{mod } 43)$

6. Let n be a natural number. Consider the following two statements.

I. If $2^n - 1$ is a prime, then $2^{n-1}(2^n - 1)$ is a perfect number.

II. If $2^n - 1$ is a prime number, then n is a prime number.

Then

A) Both (I) and (II) are true.

B) (I) is true but (II) is false.

C) (I) is false but (II) is true

D) Both (I) and (II) are false.

7. The multiplicative inverse of $x = 4 (\text{mod } 9)$ is

A) 2 (mod 9)

B) 3 (mod 9)

C) 8 (mod 9)

D) 7 (mod 9)

8. The polynomial congruence $X^{104} + X + 4 = 0 \pmod 5$, is equivalent to which of the following polynomial congruence :

A) $X^4 + 4 \equiv 0 (\text{mod } 5)$

B) $X + 4 = 0 (\text{mod } 5)$

C) $X = 0 (\text{mod } 5)$

D) $X^4 + X + 3 \equiv 0 (\text{mod } 5)$

9. Which of the following congruence does not have a solution?

A) $x^2 \equiv -1 \pmod 5$

B) $x^2 \equiv -1 \pmod{43}$

C) $x^2 \equiv -1 \pmod{13}$

D) $x^2 \equiv -1 \pmod{37}$

10. Which of the following is false?

A) $6! \equiv -1 \pmod 7$

B) $10! \equiv -1 \pmod{11}$

C) $4! \equiv -1 \pmod 5$

D) $13! \equiv -1 \pmod{14}$

11. Which of the following linear congruence does not have any solution?

A) $3x \equiv 9 \pmod 5$

B) $3x \equiv 9 \pmod{24}$

C) $5x \equiv 15 \pmod{12}$

D) $2x \equiv 3 \pmod 4$

12. Let a,b, c be integers. Consider the following two statements :

I. $\gcd(a,b) = \gcd(a+kb,b)$ for all $k \in \mathbb{Z}$.

II. If $a|c$ *and* $b|c$, then $ab|c$. (Here the symbol $x|y$ means x divides y).

A) Both (I) and (II) are true.

B) (I) is true but (II) is false.

C) (I) is false but (II) is true.

D) Both (I) and (II) are false.

13. Which of the following set is not a vector space over the given field?

A) The set of real numbers over the field of rational numbers.

B) The set of complex numbers over the field of rational numbers.

C) The set of complex numbers over the field of real numbers

D) The set of rational numbers over the field of real numbers.

14. Let $V=\{A\in M_{4\times4}(\mathbb{R})\mid trace(A)=0\}$ be a vector space over the field of real numbers. Then the dimension of this vector space is :

A) 8 B) 7

C) 15 D) 16

15. Suppose the functions f_1, f_2 be defined on the real time. Which of the following pair of functions are linearly dependent?

A) $f_1(x)=e^x, f_2(x)=xe^x$

B) $f_1(x)=\sin x, f_2(x)=\cos x$

C) $f_1(x)=\sin^2 x, f_2(x)=\cos^2 x$

D) $f_1(x)=\sin x, f_2(x)=x\sin x$

16. Choose the correct statement.

A) Every vector space has a unique basis.

B) Minimal linearly independent set is a basis.

C) Minimal generating set is a basis.

D) All of the above.

17. Which of the following set is not a subspace of the vector space $\mathbb{R}^4$ over the field $\mathbb{R}$ of real numbers?

A) $S=\{(x_1,x_2,x_3,x_4)\mid x_1=x_2=x_3, x_4=0\}$

B) $S=\{(x_1,x_2,x_3,x_4)\mid x_1=x_2=x_3=x_4\}$

C) $S=\{(x_1,x_2,x_3,x_4)\mid x_1+x_2=0\}$

D) $S=\{(x_1,x_2,x_3,x_4)\mid x_1^2-x_2^2=0\}$.

18. What is the rank of the matrix $A=\begin{bmatrix}1&1&1\\1&1&1\\1&1&1\end{bmatrix}$?

A) 1

B) 9

C) 3

D) 2

19. Let A be a 3×3 real symmetric matrix whose eigen values are 2,2,3. Let λ and μ denote the algebraic and geometric multiplicity of the eigenvalue 2 respectively. Then

A) $\lambda=2,\mu=1$.

B) $\lambda=2,\mu=2$

C) $\lambda=1,\mu=2$

D) The given information is not sufficient

20. The eigen values of the matrix $A=\begin{bmatrix}1 & 8 & 0\\ 0 & 2 & 3\\ 0 & 0 & 2\end{bmatrix}$ are :

A) 1,8,2

B) 1,2,2

C) 1,2,3

D) 2,2,3

21. Choose the correct statement.

A) Every matrix A with entries from the field $\mathbb{F}$ has an eigen value in $\mathbb{F}$.

B) If v_1 and v_2 are two eigen vectors corresponding to an eigen value λ, then v_1 and v_2 are linearly dependent.

C) Every matrix with entries from the filed of complex numbers is diagonalisable.

D) None of the above.

22. Find the values of x and y in the matrix $P=\begin{bmatrix}0 & x+y & 4\\ 3 & 0 & 9\\ x & -9 & 0\end{bmatrix}$, if it is a skew - symmetric matrix.

A) $x=-4,y=5$

B) $x=-4,y=1$

C) $x=-3,y=0$

D) $x=-4,y=7$.

23. Let V and W be two vector spaces over the same field $\mathbb{F}$ such that $\dim(V) = \dim(W) = 100$. Let $T : V \to W$ be a linear transformation. Then T is surjective if and only if.

A) $Ker(T)$ is a subspace of V

B) $Ker(T) = \{0\}$

C) $Ker(T) = V$

D) $Ker(T) = W$

24. The associated symmetric matrix to the quadratic form $x^2 + 2y^2 - z^2 - 2xy + 2yz$ is :

A) $\begin{bmatrix} 1 & -1 & 0 \\ -1 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}$

B) $\begin{bmatrix} 1 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}$

C) $\begin{bmatrix} 1 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & -1 \end{bmatrix}$

D) $\begin{bmatrix} 1 & 1 & 0 \\ 1 & 2 & -1 \\ 0 & -1 & -1 \end{bmatrix}$

25. Pick the correct statement :

A) The set of natural numbers $\mathbb{N}$ cannot be a group under any binary operation.

B) The set of rational number $(\mathbb{Q}, -)$ is a group under subtraction.

C) The set of $n \times n$ invertible matrices $(GL_n(\mathbb{R}), +)$ is a group under addition.

D) None of the above.

26. Pick the correct statement:

A) Every abelian group is a cyclic group.

B) In an infinite group, there exists an element whose order is not finite.

C) Every finite abelian group is a direct sum of cyclic groups.

D) There exists a non - abelian group of order 4.

27. Let G be a non - abelian group of order 125. Then the number of elements in the center of the group G are :

A) 1

B) 5

C) 25

D) 125

28. Let $U(n)=\{a \mid 1 \le a < n, \gcd(a,n)=1\}$ be a group under multiplication modulo n. Then the order of the element 3 in the group $U(10)$ is :

A) 1

B) 2

C) 3

D) 4

29. Let A_n denotes the group of even permutations on n symbols. Then the largest possible order of an element in the group A_{10} is :

A) 30

B) 21

C) 10

D) 24

30. Let G be a group of order 56. Then

A) The order of a sylow 2 - subgroup is 2

B) The order of a sylow 7-subgroup is 56.

C) The order of a sylow 2 - subgroup is 8.

D) G do not have any sylow 7 - subgroup.

31. Choose the correct statement.

A) The set of rational numbers under addition is a cyclic group.

B) The set of real numbers under addition is a cyclic group.

C) Every cyclic group of order 32 has two distinct subgroups of order 16.

D) For every divisor d of n, a cyclic group of order n has a unique subgroup of order d.

32. Choose the correct statement.

A) $\mathbb{Z} \oplus \mathbb{Z}$ is an integral domain

B) $\mathbb{Z} \oplus 0$ is an integral domain.

C) Every integral domain is a field

D) There exists an integral domain of characteristic 4.

33. Which of the following statement is false?

A) If R is an Euclidean domain, then $R[X]$ is also an Euclidean domain

B) If R is a commutative ring with unity, then $R[X]$ is also a commutative ring with unity.

C) If R is an integral domain, then $R[X]$ is also an integral domain.

D) Every PID is a UFD.

34. Let I and J be two ideals in a commutative ring R with unity. Then

A) $I+J=IJ$

B) $IJ = I \cap J$

C) $IJ \subseteq I \cap J$

D) $I \cap J \subseteq IJ$

35. Which of the following set is not a ring?

A) $M_n(\mathbb{R})$; the set of $n \times n$ matrices with real entries.

B) $GL_n(\mathbb{R})$; the set of $n \times n$ invertible matrices with real entries.

C) C[0,1]; the set of real valued continuous functions on the interval [0,1].

D) $\mathbb{Z}[i]$; the set of Gaussian integers.

36. How many subfields does a field of order 16 has?

A) 1

B) 2

C) 3

D) 4

37. Let $z=-1+3i$. Then $z^{-1}=$

A) $\frac{-1-3i}{10}$

B) $\frac{-1-3i}{-8}$

C) $\frac{-1-3i}{8}$

D) $\frac{-1-3i}{-10}$

38. The radius of convergence of the power series $\sum_{n=0}^{\infty} 2^{-n} z^n$ is :

A) $\frac{1}{2}$

B) 1

C) 0

D) 2

39. Let $f(z)=\sum_{n=0}^{\infty}\frac{z^{2n}}{(2n)!}$, then the second derivative $f''(z)$ is :

A) $2n(2n-1)\,f(z)$.

B) $2n\,f(z)$.

C) $f(z)$.

D) $\frac{f(z)}{2}$.

40. The value of $\int_\gamma z^3 dz$ is, where $\gamma(t) = 1+it$, $0 \le t \le 1$.

A) $\frac{(1+i)^4}{4} + \frac{1}{4}$

B) $\frac{(1+i)^4}{4} - \frac{1}{4}$

C) 0

D) 1

41. The value of $\int_\gamma \sin z \, dz$ is, where γ is a path from origin to the point $1+i$, taken along the parabola $y = x^2$.

A) 1+cos(1+i)

B) 0

C) 2π i.

D) 1-cos(1+i).

42. The value of $\log i$ is:

A) $-i\frac{\pi}{2}$

B) $i\frac{\pi}{2}$

C) 1

D) Not defined

43. Let $f : \mathbb{C} \to \mathbb{C}$ be an entire function. In which of the following case f is a constant function?

A) $\text{Im}(f) > 0$

B) $\text{Re}(f) > 0$

C) $\text{Im}(f) = 0$

D) All of the above.

44. The value of $\int_\gamma \frac{\cos z}{z} dz$ is, where $\gamma(t) = e^{it}, 0 \le t \le 2\pi$

A) 0

B) $2\pi i$

C) $-\pi i$

D) πi

45. The residue of $f(z) = \frac{e^z}{z^4}$ at z = 0 is :

A) 1

B) 0

C) $\frac{1}{3}$

D) $\frac{1}{6}$

46. Let f be a function which is analytic inside and on the unit circle. Suppose that $|f(z) - z| \le |z|$ on the unit circle. Then,

A) $\left|f'\left(\frac{1}{2}\right)\right| = 0$

B) $\left|f'\left(\frac{1}{2}\right)\right| = 1$

C) $\left|f'\left(\frac{1}{2}\right)\right| \le 8$

D) $\left|f'\left(\frac{1}{2}\right)\right|$ is unbounded.

47. The number of zeroes of the polynomial $z^{87} + 36z^{57} + 71z^4 + z^3 - z + 1$ inside the circle centered at origin of radius 1 are :

A) 1

B) 2

C) 3

D) 4

48. The fraction linear map which maps $0,1,\infty$ on $1, \infty, 0$ is :

A) $F(z)=\frac{1}{z+1}$

B) $F(z)=\frac{1}{-z+1}$

C) $F(z)=\frac{1}{2z+1}$

D) $F(z)=\frac{1}{-2z+1}$

49. Let d be the standard metric topology on the metric space $\mathbb{R}^2$. Let $T \subset \mathbb{R}^2$ be a triangle whose sides are of length 7cm, 8 cm and 10 cm respectively. Then the diameter of the triangle is :

A) 7 cm

B) 10 cm

C) 8 cm

D) 25 cm

50. Let $f_n : X \to Y$ be a sequence of continuous functions from a metric X to the metric space Y. If $\{f_n\}$ convergence uniformly to a function f, then

A) f is a uniformly continuous function.

B) f is a continuous function but need not to be uniformly continuous.

C) f need not to be a continuous function.

D) f will be a constant function.

51. Let $\pi_1 : \mathbb{R} \times \mathbb{R} \to \mathbb{R}$ be projection onto the first coordinate. Then which of the following is false?

A) π_1 is a quotient map.

B) π_1 is a continuous map.

C) π_1 is a closed map.

D) π_1 is an open map.

52. Let $Y=[-1,0)\cup(0,1]$ be a subspace of the real line. The topology on Y is the subspace topology coming from $\mathbb{R}$. Consider the following two statements :

I) $[-1,0)$ is open in Y.

II) $(0,1]$ is open in Y.

Then,

A) Both (I) and (II) are true.

B) (I) is true but (II) is false.

C) (I) is false but (II) is true.

D) Both (I) and (II) are false.

53. Cosider the set $S=\left\{x\times\sin\left(\frac{1}{x}\right)\middle| 0<x\leq 1\right\}\subseteq R^2$. Then,

A) S is a connected set.

B) $\bar{S}$ is path connected. (Here $\bar{S}$ denote the closure of S).

C) S is not a connected set.

D) None of the above.

54. Let $d:X\to\mathbb{R}$ be a metric on X and $\alpha\in\mathbb{R}$. Let $-\alpha d$ denote the scalar multiplication of the map d by $-\alpha$. Then $-\alpha d:X\to\mathbb{R}$ will be a metric if

A) $\alpha>0$

B) $\alpha=0$

C) $\alpha<0$

D) $\alpha=1$

55. Let A be any subset of a metric space X. Then

A) A is closed if and only if A is a neighbourhood of each of its points.

B) A is closed if and only if interior $(A)=A$.

C) A is closed if any only if A contains all its limit points.

D) A is closed if and only if A is open.

56. Which of the following statement is always true?

A) Every finite set is a closed set.

B) Every singleton set is an open set.

C) Every closed subset of the real line is a closed interval.

D) Every open subset of the real line is an open interval.

57. Let $X = \{a, b, c, d\}$, then which of the following set is not a topology on X?

A) $\{\phi, \{a\}, X\}$

B) $\{\phi, X\}$

C) $\{\phi, \{a\}, \{c\}, \{a, c\}, X\}$

D) $\{\phi, \{a\}, \{d\}, X\}$

58. Two sets A and B are not separated sets if

A) A =(1,2), B = (2,3)

B) A =(2,3), B = (3,7)

C) A =(2,3), B = (4,5)

D) A =(2,3), B = (3,4).

59. Choose the correct statement :

A) $SL_n(\mathbb{R})$ is an open set in $GL_n(\mathbb{R})$.

B) $SL_n(\mathbb{R})$ is a closed set in $GL_n(\mathbb{R})$.

C) $SL_n(\mathbb{R})$ is neither an open nor a closed set in $GL_n(\mathbb{R})$.

D) $SL_n(\mathbb{R})$ is an open as well as a closed set in $GL_n(\mathbb{R})$.

60. Let d be the usual metric defined as $d(x, y) = |x - y|, \forall x, y \in \mathbb{R}$. If $A = [1, 2]$ and $B = [4, 5]$, then the relation between diameters of A and B is :

A) diam(A) - diam(B) = 0.

B) diam(A) + diam(B) = 0.

C) 1+diam(B) = diam(A).

D) 1+diam(A) = diam(B).

61. Let $a_n = (n+1)^{50} e^{-\sqrt{n}}$ for $n \geq 1$. Then $\lim_{n \to \infty} a_n =$

A) ∞

B) 50!

C) 1

D) 0

62. Let f be a real valued function on $[0, \infty)$ defined by $f(x) = \begin{cases} x^{\frac{2}{3}} \log x & \text{for } x > 0; \\ 0 & \text{if } x = 0. \end{cases}$ Then,

A) f is discontinuous at $x = 0$

B) f is continuous on $[0, \infty)$ but not unformly continuous on $[0, \infty)$.

C) f is uniformly continuous on $[0, \infty)$.

D) f is not uniformly continuous on $[0, \infty)$ but uniformly continuous on $(0, \infty)$.

63. Which of the following set is uncountable?

A) The set of rational numbers.

B) The set of all sequences of non - negative integers.

C) The set of all roots of all monic polynomials in one variable with rational coefficients.

D) The set of integers.

64. In which of the following case the series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converges?

A) $p = 1$

B) $p = \frac{1}{4}$

C) $p = \frac{3}{2}$

D) $p = \frac{1}{2}$

65. Which of the following function is not continuous at $x=0$?

A) $f(x)=\begin{cases} x^2\sin\left(\frac{1}{x}\right), & x\neq 0; \\ 0, & x=0. \end{cases}$

B) $f(x)=\begin{cases} x^2\cos\left(\frac{1}{x}\right), & x\neq 0; \\ 0, & x=0. \end{cases}$

C) $f(x)=x^{\frac{3}{5}}, \forall x\in\mathbb{R}$

D) $f(x)=\begin{cases} \frac{1}{x}\sin\left(\frac{1}{x^2}\right), & x\neq 0; \\ 0, & x=0. \end{cases}$

66. Let $f:(0,1)\to\mathbb{R}$ be a continuous function such that $f(r)=0$ for all rational numbers r in $(0,1)$. Then,

A) $f(x)=0, \forall x\in(0,1)$

B) f is not a constant function.

C) There exists $x\in(0,1)$ such that $f(x)<0$

D) There exists $x\in(0,1)$ such that $f(x)>0$

67. Let $f:[0,1]\to\mathbb{R}$ be a continous function. Then which of the following is false?

A) f is uniformly continuous function.

B) $f([0,1])$ is a bounded subset of $\mathbb{R}$.

C) f is an onto map.

D) $f([0,1])$ is a compact subset of $\mathbb{R}$.

68. Let $f_n(x)=\frac{1}{n}\sin nx$ for all $x\in\mathbb{R}$ be a sequence of real valued functions. Consider the following two statements.

I. $f_n\to 0$ pointwise on $\mathbb{R}$.

II. $f_n\to 0$ uniformly on $\mathbb{R}$.

Then,

A) Both (I) and (II) are true.
B) (I) is true but (II) is false.
C) (I) is false but (II) is true.
D) Both (I) and (II) are false.

69. Let $f:\mathbb{R}\to\mathbb{R}$ be a function such that $|f(x)-f(y)|\le(x-y)^2$ for all $x,y\in\mathbb{R}$. Then,

A) f is a non - constant polynomial function.
B) f is a constant function.
C) f is an exponential function.
D) f is not a uniformly continuous function.

70. Let $f:[-1,1]\to\mathbb{R}$ be a continuous function. Then $\lim_{h\to 0}\frac{1}{h}\int_{-h}^{h}f(t)dt$ is :

A) 0
B) 1
C) $2f(0)$
D) $f(0)$

71. Let $A=[0,1]\cap\mathbb{Q}$, where $\mathbb{Q}$ denotes the set of rational numbers. Consider the function $f:[0,1]\to\mathbb{R}$ defined as

$$f(x)=\begin{cases}1, \text{ if } x\in A;\\ 0, \text{ if } x\notin A.\end{cases}$$

Consider the following two statements :

(I) f is Riemann integrable.
(II) f is Lebesgue integrable.

Then,

A) Both (I) and (II) are true.
B) (I) is true but (II) is false.
C) (I) is false but (II) is true.
D) Both (I) and (II) are false.

72. Let $f:\mathbb{R}^2 \to \mathbb{R}$ be a continuous map such that $f(x) = 0$ for only finitely many values of x. Then which of the following is true?

A) Either $f(x) \le 0$ for all x, or $f(x) \ge 0$ for all x

B) The map f is an onto map.

C) The map f is one - to - one

D) Image (f) is a disconnected subset of $\mathbb{R}$.

73. Which of the following differential equation is not exact?

A) $(3y + 4xy^2)dx + (2x + 3x^2y)dy = 0$

B) $(2x\cos y + 3x^2\,y)dx + (x^3 - x^2\sin y - y)dy = 0$

C) $(3x^2 + 4xy)dx + (2x^2 + 2y)dy = 0$

D) $(2x\sin y + y^3e^x)dx + (x^2\cos y + 3y^2e^x)dy = 0$.

74. Which of the following differential equation do not have any solution?

A) $\frac{dy}{dx} = -\frac{x}{y}, y(3) = 4$

B) $\frac{d^2y}{dx^2} + y = 0, y(0) = 1$ and $y(\pi) = 5$

C) $\frac{dy}{dx} = y^{\frac{1}{3}}, y(0) = 0$.

D) $\frac{dy}{dx} = x, y(0) = 0$.

75. An integrating factor for the differential equation $\frac{dy}{dx} + \left(\frac{2x+1}{x}\right)y = e^{-2x}$ is :

A) e^{2x}

B) x^2e^{2x}

C) xe^{2x}

D) e^x

76. Let $f_1(x) = \sin x$, $f_2(x) = \cos x$. Then the Wronskian $W(f_1, f_2) =$

A) 1

B) -1

C) 0

D) $\frac{\pi}{2}$

77. Given that $y - x$ is a solution of the differential equation $(x^2+1)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 0$, the other linearly independent solution is :

A) $y = 2x$

B) $y = x^2 + 1$

C) $y = x^2$

D) $y = x^2 - 1$

78. Let $y = x^3$ and $y = x^5$ are two linearly independent solutions of the corresponding homogenous equation of the differential equation $x^2\frac{d^2y}{dx^2} - 6x\frac{dy}{dx} + 10y = 3x^4 + 6x^3$. Then the general solution of this differential equation is :

A) $y = c_1x^2 + c_2x^5 - 3x^3 - \frac{3}{2}x^4$

B) $y = c_1x^2 + c_2x^5 - x^3 - x^4$

C) $y = c_1x + c_2x^3 + x^2 + x^6$

D) $y = c_1x^2 + c_2x^5 - \frac{3}{2}x^3 + 3x^4$

79. The type of PDE $\frac{\partial^2u}{\partial x^2} + 3\frac{\partial^2u}{\partial y^2} + 3\frac{\partial^2u}{\partial x \partial y} + 5\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 0$ is:

A) Hyperbolic

B) Parabolic

C) Elliptic

D) None of these

80. The solution at $x = 1, t = 1$ of the PDE $16\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$ subject to the initial condition $u(x,0) = 2x, u_t(x,0) = 2$ is :

A) 2

B) 4

C) 6

D) 1

81. The number of the real characteristics curves of the PDE

$$(x^2+2y)\frac{\partial^2 u}{\partial x^2} + (y^3 - y - x)\frac{\partial^2 u}{\partial y^2} + x^2(y-1)\frac{\partial^2 u}{\partial x \partial y} + 3\frac{\partial^2 u}{\partial x} + u = 0$$

Passing through the point $x = 1, y = 1$ are.

A) 0

B) 1

C) 2

D) Infinitely many.

82. The cauchy problem $y\frac{\partial z}{\partial x} + x\frac{\partial z}{\partial y} = 0$ and $x_0(t) = -\cos t, y_0(t) = \sin t, z_0(t) = 1$ has

A) Unique solution.

B) No solution

C) Infinite solutions.

D) More than one but finite solutions.

83. The largest interval in which the PDE $\frac{\partial z}{\partial x} - z\frac{\partial z}{\partial y} + z = 0$ with $x_0 = 0, y_0 = 2s, z_0 = -2s$ has unique solution.

A) $-1 \le s \le 1$

B) $-\infty \le s \le 0$

C) $0 < s < \infty$

D) $-\infty < s < \infty$

84. Let $u(x,y)$ be the solution of the Cauchy problem $x^2\frac{\partial u}{\partial x}-y^2\frac{\partial u}{\partial y}=0$, such that $u \to e^x$ as $y \to \infty$. Then u(1,1) is :

A) -1

B) 0

C) e

D) e^2

85. If third differences are constant and $2y_{x+\frac{1}{2}}=(y_x+y_{x+1})+A\left(\Delta^3 y_{x-1}+\Delta^3 y_x\right)$, then 8A =

A) -1

B) $\frac{-1}{2}$

C) 2

D) 1

86. The function, whose first difference is $\sin x$ and $h = \pi$, is :

A) $-2 \sin x$

B) $-\cos x$

C) $-\frac{1}{2}\sin x$

D) $-\frac{1}{2}\cos x$

87. Back substitution procedure is used in

A) Gauss elimination method.

B) Jacobi's method.

C) Gauss - Seidel method.

D) Relaxation method.

88. If $f(x)=0$, then Newton - Raphson formula for nearly equal roots is

A) $x_{n+1} = x_n - \frac{x_n f(x_n)}{f'(x_n)}$

B) $x_{n+1} = x_n - \frac{f(x_n)}{x_n f'(x_n)}$

C) $x_{n+1} = x_n - \frac{f'(x_n)}{f''(x_n)}$

D) $x_{n+1} = x_n - \frac{x_n f'(x_n)}{f'(x_n)}$

89. Use the Gauss - Seidel method to solve the following equations (as per the given order)

$x_1 + x_2 + x_3 = 2$
$2x_1 + 3x_2 + x_3 = 4$
$3x_1 + 2x_2 + x_3 = 3$

Assuming the initial guess as $x_1 = x_2 = x_3 = 0$. Then the value of x_3 after the first iteration is :

A) 0

B) -2

C) -3

D) None of these

90. Newton - Raphson method is used to compute a root of the equation $x^2 - 11 = 0$ with 2.5 as the intial value. The approximation after one iteration is :

A) *3.45*

B) *3.35*

C) *3.55*

D) *3.75*

91. Which of the following function is the Laplace transformation of the sine hyperbolic function f(t) = sinh$t$?

A) $\frac{1}{s^2-1}$

B) $\frac{s}{s^2-1}$

C) $\frac{1}{s^2}$

D) $\frac{s^2}{s^2-1}$

92. The inverse Laplace transformation of $\frac{s^2-b^2}{(s^2+b^2)^2}$ is

A) $t \sin bt$

B) $\sin bt$

C) $\cos bt$

D) $t \cos bt$

93. Let the inverse Laplace transformation $L^{-1}\{F(p)\} = f(t)$ and $f(0) = 0$, then $L^{-1}\{pF(p)\} =$

A) $f'(t) - t$

B) $\frac{f'(t)}{t}$

C) $tf'(t)$

D) $f'(t)$

94. If the Laplace transformation $L\left\{\frac{\sin t}{t}\right\} = \cot^{-1} p$, then $L\left\{\frac{\sin at}{t}\right\} =$

A) $\tan^{-1}\frac{1}{ap}$

B) $\tan^{-1}\frac{a}{p}$

C) $\tan^{-1} ap$

D) $\frac{1}{a}\tan^{-1}\frac{1}{p}$

95. Numerical integration using Trapezoidal rule gives the best result for a single variable function, which is?

A) Parabolic.
B) Linear.
C) Hyperbolic.
D) Logarithmic.

96. The fourier transform of $x(t) = e^{-a|t|}$ is :

A) $\frac{a}{a^2 + (2\pi f)^2}$
B) $\frac{a}{a^2 + (\pi f)^2}$
C) $\frac{2a}{a^2 - (2\pi f)^2}$
D) $\frac{2a}{a^2 + (2\pi f)^2}$

97. The graph in which, there is a closed trail which includes every edge of the graph is known as :

A) Hamiltonian graph.
B) Euler graph.
C) Planar graph.
D) Spanning graph.

98. The number of spanning trees of the complete graph on 5 vertices is :

A) 125
B) 50
C) 25
D) 625

99. A graph G on n vertices is bipartite if it contains :

A) n^2 edges.
B) n edges.
C) A cycle of odd length
D) No cycle of odd length.

100. Which of the following satement is false :

A) Each tree has a leaf vertex
B) There exists a k - regular graph on n vertices such that both n and k are odd
C) There exists a triangle - free graph of chromatic number 5.
D) Chromatic number of a planar graph is at most 4.

101. Let G be a planar graph on n vertices and e edges. If f is the number of faces in a planar drawing of G, then

A) $n = e - f + 2$
B) $n = f - e + 2$
C) $n = e + f - 2$
D) $n = e - f - 2$

102. The number of edges in a tree on 10 vertices is :

A) 10

B) 20

C) 9

D) 5

103. Number of edges incident with a vertex u in a graph G is called

A) Incidence number of G

B) Vertex cover of G.

C) Degree of u.

D) None of the above

104. Let G be graph on n vertices and of minimum degree $d \geq 2$. Then

A) G has a path of length d.

B) G has a cycle of length $d+1$.

C) Chromatic number of G is d.

D) Number of edges of G is nd.

105. Let A, B, C be three subsets of $\mathbb{R}$. The negation of the following statement : for every $\epsilon > 1$, there exists $a \in A$ and $b \in B$ such tht for all $c \in C, |a-c| < \epsilon$ and $|b-c| > \epsilon$

A) There exists $\epsilon \leq 1$, such that for all $a \in A$ and $b \in B$ there exists $c \in C$ such that $|a-c| \geq \epsilon$ or $|b-c| \leq \epsilon$.

B) There exists $\epsilon \leq 1$, such that for all $a \in A$ and $b \in B$ there exists $c \in C$ such that $|a-c| \geq \epsilon$ and $|b-c| \leq \epsilon$.

C) There exists $\epsilon > 1$, such that for all $a \in A$ and $b \in B$ there exists $c \in C$ such that $|a-c| \geq \epsilon$ and $|b-c| \leq \epsilon$.

D) There exists $\epsilon > 1$, such that for all $a \in A$ and $b \in B$ there exists $c \in C$ such that $|a-c| \geq \epsilon$ or $|b-c| \leq \epsilon$.

106. Suppose you have 10 white and 10 black socks. Assume that are picking socks randomly, one sock at a time. Then the minimum number of draws required so that you will definitely have a matching pair :

A) 2

B) 11

C) 3

D) 5

107. The number of seven digit integers, with sum of the digits equal to 10 and formed by using the digits 1, 2 and 3 only, is

A) 35

B) 77

C) 42

D) 82

108. In how many ways 5 persons A, B, C, D, E can sit in a row so that A and B never sit together?

A) 120

B) 96

C) 24

D) 72

109. Which of the following is true?

A) The unit sphere $\{x \in l^2 \mid \|x\|_2 = 1\}$ is compact in l^2

B) The unit sphere $\{x \in l^2 \mid \|x\|_2 = 1\}$ is not compact in l^2

C) The unit sphere $\{x \in l^2 \mid \|x\|_2 = 1\}$ is not closed in l^2

D) The unit sphere $\{x \in l^3 \mid \|x\|_3 = 1\}$ is compact in l^3

110. C[0,1] is a Hilbert space with respect to which of the following norm?

A) $\|\cdot\|_1$

B) $\|\cdot\|_2$

C) $\|\cdot\|_\infty$

D) None of the above.

111. Which of the following is not a separable space?

A) $l^p(\mathbb{N}), 1 \le p < \infty$

B) $L^p([a,b]), 1 \le p < \infty$.

C) $C[a,b]$ with $\|\cdot\|_\infty$ norm

D) $l^\infty(\mathbb{N})$

112. Which of the following is true?

A) $C[a,b]$ has a finite basis.

B) $C[a,b]$ has a countably infinite basis.

C) $C[a,b]$ has an uncountable basis.

D) None of the above

113. Let $X = C_{00}$ with $\|\cdot\|_2$ norm and let $f : X \to \mathbb{R}$ be a linear functional defined as

$f(x) = \sum_{j=1}^{\infty} \frac{x(j)}{j}$. Then

A) $N(f)^\perp = \{0\}$

B) $N(f)^\perp = \{C_{00}\}$

C) $N(f)^\perp = e_n \forall n \ge 1$

D) $N(f)^\perp = \left(-1, \frac{1}{n}, \frac{1}{n}, \ldots, \frac{1}{n}, 0, 0 \ldots\right)$

114. Let $X = \mathbb{C}^2$ and $\lambda_1, \lambda_2 \in \mathbb{C}$. Define $A : X \to X$ by $A(\alpha_1, \alpha_2) = (\lambda_1\alpha_1, \lambda_2\alpha_2)$. Then, for what values of λ_1 and λ_2, A is a unitary operator?

A) $\lambda_1 = 0, \lambda_2 = i$

B) $\lambda_1 = i, \lambda_2 = 0$

C) $\lambda_1 = i, \lambda_2 = -i$

D) $\lambda_1 = 2i, \lambda_2 = -2i$

115. Which of the following is not a Banach space?

A) $C[a,b]$ *with* $\|\cdot\|_\infty$ norm

B) $L^p[a,b], 1 \le p < \infty$

C) C_∞ *with* $\|\cdot\|_\infty$ norm

D) C_0 *with* $\|\cdot\|_\infty$ norm.

116. Which of the following is false?

A) $\{e_1, e_2, e_3, \ldots\ldots\}$ is a basis for C_∞

B) $\{e_1, e_2, e_3, \ldots\ldots\}$ is a basis for l^2

C) $\{e_1, e_2, e_3, \ldots\ldots\}$ is an orthonormal basis of C_∞

D) $\{e_1, e_2, e_3, \ldots\ldots\}$ is an orthonormal basis for l^2

117. Let $X = \{x \in C[0,1] \mid x(0) = 0\}$ with $\|\cdot\|_\infty$ norm and $f(x) = \int_0^1 x(t)dt$.

Then $\|f\|$ equal to

A) 0

B) $\frac{1}{2}$

C) $\frac{1}{3}$

D) 1

118. Let $X = Y = C[0,1]$ with $\|\cdot\|_\infty$ norm and $X_0 = C^1[0,1]$. Let $A : X_0 \to Y$ defined by $Ax = x'$.

Then

A) A is closed and a cotinuous operator.

B) A is not closed and but a continuous operator.

C) A is closed and but not a continous operator.

D) A is neither closed nor a continuous operator.

119. Any two norms on a linear space N are equivalent if N is

A) Finite dimensional

B) Infinite dimensional.

C) Complete space.

D) Banach space.

120. Consider the space $B(N,M) = \{f : N \to M \mid f \text{ is a bounded linear operator}\}$ of bounded linear operators. Then $B(N,M)$ is a Banach space if and only if.

A) N is a Banach space.

B) M is a Banach space.

C) Both N and M are Banach spaces.

D) None of these.

ROUGH WORK

ROUGH WORK

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

Booklet Serial No.

Test Booklet Series

TEST BOOKLET
ASSISTANT PROFESSOR
MECHANICAL ENGINEERING
Written Test - 2023
(13)

A

Time Allowed: Two Hours ***Maximum Marks: 120***

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT* write *anything else*** on the Test Booklet.
4. This Test booklet contains **120** items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer /Response Sheet provided. *See directions in the Response Sheet.*
6. ***All*** items carry equal marks.
7. Before you proceed to mark in the Answer /Response Sheet, the response to various items in the Test Booklet, you have to fill in some particulars in the Answer /Response Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer /Response Sheet.*** You are permitted to take away with you the Test Booklet and ***Candidate's Copy of the Response Sheet*** .
9. Sheets for rough work are appended in the Test Booklet at the end.
10. While writing Centre, Subject and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN".**
11. **Penalty for wrong answers:**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).

    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **(0.25)** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

1. A block of 200 mm × 200 mm base and 10 mm height. When a tangential force of 10kN is applied on the upper edge it is displaced 2 mm relative to the lower face. Then the **direct shear stress** and **shear strain** in the element is

A) 1 MPa, 0.1

B) 2.5 MPa, 0.1

C) 1 MPa, 0.2

D) 2.5 MPa, 0.2

2. The number of elastic constants required to relate stress and strain for the materials

a.	Isotropic	i.	21
b.	Orthotropic	ii.	2
c.	Anisotropic	iii.	4
		iv.	9

A) $a \rightarrow ii, b \rightarrow iii, c \rightarrow i$

B) $a \rightarrow ii, b \rightarrow iii, c \rightarrow iv$

C) $a \rightarrow iii, b \rightarrow iv, c \rightarrow i$

D) $a \rightarrow ii, b \rightarrow iv, c \rightarrow i$

3. The modulus of elasticity and rigidity of a material are 200 GPa and 80 GPa, respectively. Find the Bulk modulus of the material.

A) 233.33 GPa. B) 133.33 MPa.

C) 233.33 MPa. D) 133.33 GPa.

4. Match the following list I with list II

	List - I		**List - II**
a.	Static Friction	1.	Angle between the normal reaction and the resultant of force of friction and normal reaction
b.	Dynamic Friction	2.	The force of friction developed between two bodies at rest
c.	Solid Friction	3.	The force of friction between two bodies in motion
d.	Angle of Friction	4.	Friction between dry surfaces which are not lubricated
		5.	Friction between dry surfaces which are lubricated

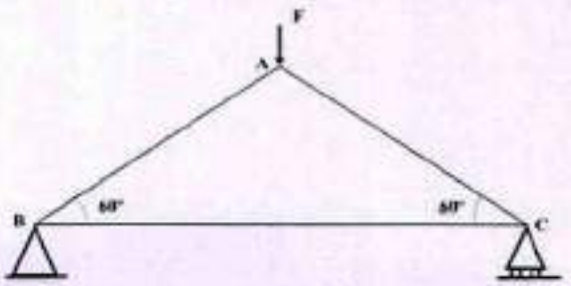
A) $a \rightarrow 2, b \rightarrow 3, c \rightarrow 5, d \rightarrow 1$

B) $a \rightarrow 4, b \rightarrow 1, c \rightarrow 4, d \rightarrow 1$

C) $a \rightarrow 2, b \rightarrow 3, c \rightarrow 4, d \rightarrow 1$

D) $a \rightarrow 4, b \rightarrow 3, c \rightarrow 5, d \rightarrow 1$

5. Consider a truss ABC loaded at A with a force F as shown in the figure

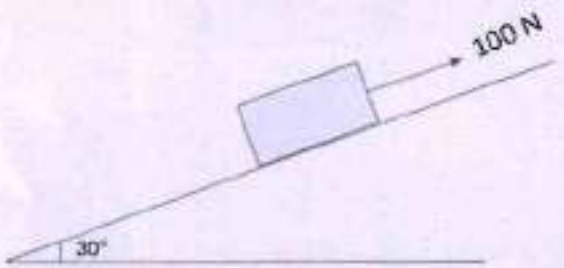


The tension in the member BC is

A) $\frac{F}{2\sqrt{3}}$ B) $\frac{F}{4\sqrt{3}}$

C) $\frac{F}{2\sqrt{2}}$ D) $\frac{F}{4\sqrt{2}}$

6. The block as shown in figure is in equilibrium and stopped from sliding down by applying a force of 100 N. The coefficient of friction is 0.25. The Weight of the block would be



A) 564 N B) 154 N

C) 354 N D) 754 N

7. Which one of the following principles cannot be used to solve problems involving Friction?

A) D'Alembert's principle

B) Equation of Motion

C) Principle of Work and energy

D) Conversation of energy

8. Match the crystal systems with their respective atomic packing factor given below in the lists:

	List - I		List - II
a.	Simple cubic	1.	0.34
b.	Face Centered	2.	0.68
c.	Body Centered	3.	0.74
d.	Diamond	4.	0.52

A) $a \rightarrow 1, b \rightarrow 3, c \rightarrow 2, d \rightarrow 4$

B) $a \rightarrow 2, b \rightarrow 3, c \rightarrow 4, d \rightarrow 1$

C) $a \rightarrow 4, b \rightarrow 3, c \rightarrow 2, d \rightarrow 1$

D) $a \rightarrow 2, b \rightarrow 4, c \rightarrow 1, d \rightarrow 3$

9. A laminar composite is composed of

A) 1-D sheets B) 2-D sheets

C) 3-D sheets D) None of the above

10. The lengths of the crank and connecting rod are 50 mm and 200 mm respectively. If the crank rotates clockwise with an angular velocity of 5 rad/s, then the linear velocity of the at the joint connecting crank and connecting rod in m/s is

A) 2.5 B) 250

C) 0.25 D) 0.025

11. Sensitiveness of a governor is defined as

A) $\frac{Mean\ Speed}{Range\ of\ Speed}$

B) $Mean\ Speed \times Range\ of\ Speed$

C) $\frac{2\ Means\ Speed}{Range\ of\ Speed}$

D) $\frac{Range\ of\ Speed}{Mean\ Speed}$

12. What is the maximum acceleration of a cam follower undergoing simple harmonic motion with stroke of the follower as 'h'; Angular velocity of the cam as ω; Cam rotation angle for the maximum follower displacement as ϕ.

A) $4h\frac{\omega^2}{\phi}$

B) $\frac{2h\pi\omega^2}{\phi^2}$

C) $4h\left(\frac{\omega}{\phi}\right)^2$

D) $\frac{h}{2}\left(\frac{\pi\omega}{\phi}\right)^2$

13. The flywheel of an engine has a radius of gyration of 0.25 m and mass 500 kg. The Initial torque of the engine is 250 N-m and may be assumed constant. Angular acceleration in rad/s^2 of the flywheel is

A) 6

B) 4

C) 2

D) 8

14. A spring-mass suspension has a natural frequency of 5 rad/s. What is the damping ratio required if it is desired to reduce this frequency to 3 rad/s by adding a damper to it?

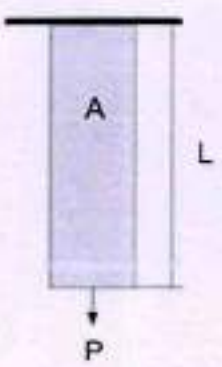
A) $\frac{5}{4}$

B) $\frac{4}{5}$

C) $\frac{2}{\sqrt{5}}$

D) $\frac{\sqrt{5}}{2}$

15. Deflection of a prismatic bar shown in figure due to its self-weight is



Y- Specific weight, L - Length of the bar, E- Young's Modulus, A - Area of the bar

A) $\frac{\gamma L^2}{6E}$

B) $\frac{\gamma L^3}{4E}$

C) $\frac{\gamma L^2}{2E}$

D) $\frac{\gamma L^3}{2E}$

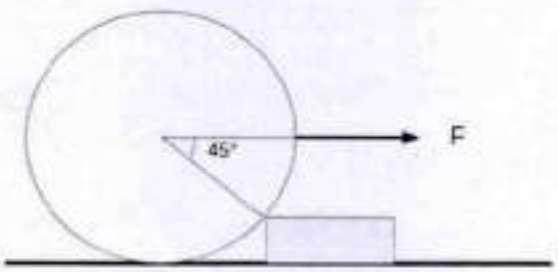
16. In a bi-axial stress problem, the stresses in x and y directions are $\sigma_x = 50MPa$ and $\sigma_y = 25MPa$. The maximum principal stress in MPa, is _____ MPa.

A) 50 Mpa
B) 40 Mpa
C) 30 Mpa
D) 20 Mpa

17. A rod 50 mm in original length. When we apply an axial compressive load 2 kN the final length of the rod after application of the load is 45 mm. So in this rod a compressive strain is developed and is given by

A) 0.001
B) 0.01
C) 0.1
D) 1.0

18. A roller of weight 'w' is rolled over the wooden block shown in the given figure below. The pull F required to just cause the said motion is



A) $\sqrt{2}w$
B) $\frac{w}{\sqrt{2}}$
C) w
D) $2w$

19. A cantilever beam carries a load W uniformly distributed over its entire length. If the same load is placed at the free end of the same cantilever, then the ratio of maximum deflection in the first case to that in the second case will be:

A) 3/8
B) 8/3
C) 8/5
D) 5/8

20. For a power transmission shaft transmitting power P at N rpm, its diameter is proportional to:

A) $\left(\frac{P}{N}\right)^{1/3}$
B) $\left(\frac{P}{N}\right)^{1/2}$
C) $\left(\frac{P}{N}\right)^{2/3}$
D) $\left(\frac{P}{N}\right)^{4/3}$

21. Match List - I (for thin cylinder) with List - II (Mathematical expressions) give below:

List - I		List - II	
a.	Hoop stress	1.	$\frac{pd}{4t}$
b.	Maximum shear stress	2.	$\frac{pd}{2t}$
c.	Longitudinal stress	3.	$\frac{pd}{2\sigma}$
d.	Cylinder thickness	4.	$\frac{pd}{8t}$
		5.	$\frac{pd}{4\sigma}$

A) $a \rightarrow 2, b \rightarrow 3, c \rightarrow 1, d \rightarrow 4$

B) $a \rightarrow 2, b \rightarrow 3, c \rightarrow 1, d \rightarrow 5$

C) $a \rightarrow 2, b \rightarrow 4, c \rightarrow 3, d \rightarrow 1$

D) $a \rightarrow 2, b \rightarrow 4, c \rightarrow 1, d \rightarrow 3$

22. Which one of the following solid defects is/are not belongs to point defect

I. Vacancy

II. Schottkey

III. Voids.

IV. Grain Boundaries

A) Only (I) B) Only (II)

C) (I) and (II) D) (III) and (IV)

23. In the Jominy end - quench test, a steel specimen with a heat transfer coefficient between the steel and fluid of 50 W/(m^2-K) and a thermal conductivity of 30 W/(m-K) undergoes quenching. Calculate the severity of the quench.

A) 0.6 B) 80

C) 1.67 D) 20

24. If in a linkage there are 4 loops and 11 links, then the number of joints and degree of freedom for the linkage are

A) 2 and 14 B) 13 and 3

C) 14 and 2 D) 3 and 13

25. Two mating gears have 20 and 80 teeth respectively. The pinion rotates at 200 rpm and transmits a torque of 40 N-m. The torque in N-m transmitted by the gear is

A) 50 B) 10

C) 160 D) 80

26. Consider the following statements :

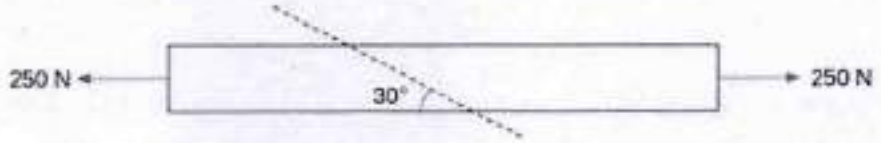
1. Critical or whirling speed of the shaft is the speed at which it tends to vibrate violently in the transverse direction.
2. To find the natural frequency of a shaft carrying several loads, the energy method gives accurate results.
3. Dunkerley's method gives approximate results of the natural frequency of a shaft carrying several loads.

Which of these statements is/are correct?

A) (1) and (2) B) (2) and (3)

C) (1) and (3) D) Only (3)

27. A bar of rectangular cross-sectional area of 25 mm^2 is pulled from both the sides by equal forces of 250 N as shown in the figure below. **The shear stress (in MPa)** along the plane making an angle 30° with the axis, shown as a dashed line in the figure, is



A) 2-4Mpa B) 3-5Mpa

C) 4-5Mpa D) 5-6Mpa

28. Graphical representation for respective theories of failure

	List - I		**List - II**
a.	Rankine's Thoery	1.	Rhombus
b.	ST. Venant's Theory	2.	Rectangular
c.	Guest and Tresca's Theory	3.	Ellipse.
d.	Haigh's Theory	4.	Hexagon

A) $a \rightarrow 2, b \rightarrow 1, c \rightarrow 4, d \rightarrow 3$ B) $a \rightarrow 2, b \rightarrow 1, c \rightarrow 3, d \rightarrow 4$

C) $a \rightarrow 3, b \rightarrow 4, c \rightarrow 1, d \rightarrow 2$ D) $a \rightarrow 2, b \rightarrow 3, c \rightarrow 1, d \rightarrow 4$

29. Nature of stress in a thin cylindrical shell subjected to internal pressure. Identify the false statement

i. Hoop stress/circumferential stress will be tensile in nature

ii. Longitudinal stress/axial stress will be tensile in nature

iii. Radial stress will be compressive in nature

iv. Longitudinal stress/axial stress will be compressive in nature

A) (i) B) (ii)

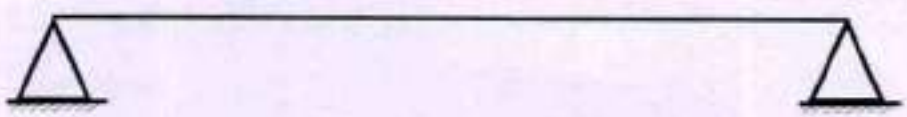
C) (iii) D) (iv)

30. A shaft of diameter 2 cm is subjected to a twisting moment of 4000 N-m and a bending moment of 3000 N-m. The maximum normal stress induced in the shaft is equal to

A) $\frac{16}{\Pi} MPa$ B) $\frac{32}{\Pi} GPa$

C) $\frac{16}{\Pi} GPa$ D) $\frac{32}{\Pi} MPa$

31. Consider the figure given below.



For given planar structure select true statements

1. Statically Indeterminate Structure
2. Statically Determinate Structure
3. Can be solved using compatibility equation

A) (1) and (2) B) (1) and (3)

C) (3) and (2) D) None of the above

32. The volume of an FCC unit cell in terms of atomic radius 'r'

A) $4r^3\sqrt{2}$ B) $16r^3\sqrt{2}$

C) $4r^3\sqrt{2}$ D) $16r^3\sqrt{2}$

33. For BCC lithium, the lattice parameter is 0.35 nm and for the set of planes (220), the interplanar spacing will be

A) 0.123 nm
B) 0.1013 nm
C) 0.123 pm
D) 0.1013 pm

34. A carbon fiber reinforced polymer composite (CFRP) is made with 40 vol% continuous unidirectional carbon fibers with an elastic modulus of 250 GPa and 60 vol% polyester resin. After it gets hardened it shows a modulus of 4.5 GPa. Modulus of elasticity of this composite in longitudinal direction is

A) 151.8 GPa
B) 102.7 GPa
C) 100 GPa
D) 150 GPa

35. Which of the following is not a non-ferrous material?

A) Copper
B) Titanium
C) Stainless Steel
D) Aluminum

36. Which one of the following statements is/are false regarding a structure

1. degree of freedom < 0
2. No relative motion between links.
3. Power cannot be transmitted.
4. Capable of transmitting force only.
5. Degree of freedom >0.

A) (1) and (4)
B) (1) and (3)
C) (4) and (5)
D) (1) and (5)

37. A spring-mass-damper system installed on the door of an air-conditioned room, to shut the door automatically after a person enters/leaves the room. Which type of spring-mass-damper system is recommended for this case.

A) Over damped system.
B) Critical damped system.
C) Under damped system
D) None of the above

38. A mini roller is used for making a cricket pitch at a stadium. The front wheel of the roller has a mass of 500 kg, a radius of gyration of 0.1 m and a diameter of 0.5 m. Find the kinetic energy of rotation (Joules) of the front wheel at a speed of 2.5 m/s?

A) 250 B) 125

C) 500 D) 1000

39. When the relation between the controlling force (F_c) and radius of rotation (r) for a spring - controlled governor is $F_c = a.r$, then the governor will be

A) Stable B) Unstable

C) Isochronous D) None of the above.

40. A single cylinder reciprocating engine has a crank speed of 320 rpm, stroke 50 mm, mass of reciprocating parts is 10 kg, mass of revolving parts at 100 mm radius are 2 kg. If one-third of the reciprocating parts and all the revolving parts are to be balanced, find the balance mass required at a radius of 200 mm

A) 2.667 kg

B) 3.557 kg

C) 4.667 kg

D) 6.667 kg

41. Let n = 0.5 and C = 400 in the Taylor equation for tool wear. What is the percentage change in tool life if the cutting speed is reduced by 20%?

A) 56.25%

B) 64.00%

C) 48.80%

D) 74.69%

42. Find area of uncut chip during machining of C-20 steel with a carbide cutting tool of 0-10-6-6-8-60°-1 mm ORS configuration with chip thickness of 0.36 mm, uncut chip width of 0.4 mm and feed of 0.2 mm/rev.

A) 0.144 mm^2. B) 0.069 mm^2.

C) 0.077 mm^2. D) 0.08 mm^2.

43. Find shear angle during machining of C-20 steel with a carbide cutting tool of 0-10-6-6-10-75°-1 mm ORS configuration with chip thickness of 0.75 mm, uncut chip thickness of 0.25.

A) 0°
B) $Tan^{-1}(0.333)$
C) $Tan^{-1}(3)$
D) $Tan^{-1}(0.45)$

44. Match the following :

1. Rake angle	i. Influences surface finish
2. Cutting edge angle	ii. Helps in chip formation
3. Clearance angle	iii. Controls direction of chip flow
4. Nose radius	iv. Effect frictional rubbing

A) 1-i,2-iii,3-iv,4-ii
B) 1-i,2-iv,3-ii,4-iii
C) 1-iv,2-iii,3-ii,4-i
D) 1-ii,2-iii,3-iv,4-i

45. Find friction angle when chip removed under minimum chip strain in orthogonal cutting process if rake angle is 0°

A) 0°
B) 30°
C) 45°
D) 90°

46. Find shear stress when F_c (cutting force) = 950 N, F_t (Thrust force) = 475 N, Uncut chip area (A_0) = 0.09 mm², θ (Shear angle) = 45°

A) 5277.77 MPa
B) 3610.79 MPa.
C) 8113.88 MPa.
D) 2640.53 MPa.

47. A 160 mm long, 13 mm diameter 304 stainless steel rod is being reduced in diameter to 12 mm in by turning on lathe. The spindle rotates at N = 400 rpm, and tool feed is 0.2 mm/ rev. Calculate the actual cutting time.

A) 1 min
B) 2 min
C) 0.5 min
D) 2.5 min

48. How does increase in discharge current effects metal removal rate and surface finish in electric discharge machining

A) As discharge current increases, MRR increases and surface finish is degraded.

B) As discharge current increases, MRR decreases and surface finish is degraded

C) As discharge current increases, MRR increases and surface finish is improved.

D) None of the above.

49. (i) Milling, (ii) Water jet cutting, (iii) Grinding, (iv) Ultrasonic machining, (v) Laser beam machining, and (vi) Wire EDM. Which of the aforementioned processes relies primarily on mechanical energy?

A) i, iv, vi.

B) ii, iii, iv, v

C) i, ii, iii, iv.

D) None of the above.

50. Which of the following procedures (one best response) would be appropriate for cutting a 0.003-inch diameter hole through a 1/16-inch-thick aluminum plate?

A) Oxyfuel cutting.

B) Chemical milling.

C) Laser beam machining.

D) Water jet cutting.

51. Determine the speed of cutting when an electrode beam used 5 kW power to cut 150 microns wide slit in a 1 mm thick tungsten sheet. Specific power consumption of in EBM (Electron beam machining) for tungsten is C = 12/ W/mm^3/min.

A) 3500 mm/min

B) 2876 mm/min.

C) 2568 mm/min.

D) 2778 mm/min

52. Which of the following joint types can be joined with a fillet weld? (i) butt, (ii) corner, (iii) lap, (iv) tee.

A) ii, iii, iv only

B) i, iv only

C) iii, iv only

D) All the types

53. Which of the following solid state welding techniques uses external heat? (i) diffusion welding, (ii) ultrasonic welding, (iii) friction welding, (iv) forge welding

A) ii, iv only.
B) i, iv only
C) iii, iv only
D) All the types

54. A sequence of spot welds, each 2.0 mm thick, are created between two pieces of aluminium using a Resistance Spot Welding procedure. Um = 2.90 J/mm^3 is the unit melting energy for aluminium. The welding current is 6,000 amps, and time is 0.15 seconds. Assume that there is 75 micro-ohms of resistance. The final weld nugget has dimensions of 5.0 mm in diameter and 2.5 mm in thickness. How much of the energy produced overall is used to create the weld nugget?

A) 35.1%
B) 29%
C) 64.9%
D) 68%

55. A shielded metal arc welding operation is performed on steel at E = 30 volts and I = 225 amps. The heat transfer efficiency $f_1 = 0.85$ and melting efficiency $f_2 = 0.75$. The unit melting energy for steel = 10.2 J/mm^3. Solve for the volume rate of metal welded.

A) 562.50 mm^3/sec.
B) 496.32 mm^3/sec.
C) 661.76 mm^3/sec.
D) 421.90 mm^3/sec.

56. Which one of the following is defined as tolerance?

A) Clearance between a shaft and a mating hole
B) Measurement error
C) Total permissible variation from a specified dimension
D) Variation in manufacturing.

57. Which of the following surface qualities involves surface texture? (i) oil films, (ii) feed marks of the tool that produced the surface, (iii) surface cracks, (iv) deviations from the nominal surface, and (v) hardness variations.

A) ii, iv only
B) ii, iii, iv only
C) i, iii, iv only
D) None of the above

58. Calculate hole tolerances for $64H_8/_7$ fit. 64 appears in the diameter steps of 50-80 ($D=\sqrt{50\times80}=63.24$) and fundamental deviation is $\varepsilon_f=-5.5D^{0.4}$. Use $IT8\rightarrow25i, IT\rightarrow16i$

(Hint : $63.24^{\frac{1}{3}}=3.984, 63.24^{\frac{1}{2}}=7.952 and\ 63.24^{\frac{2}{5}}=5.253$)

A) Maximum hole diameter = 64.046 mm, Minimum hole diameter = 64.000 mm

B) Maximum hole diameter = 63.97 mm, Minimum hole diameter = 63.941 mm

C) Maximum hole diameter = 64.046 mm, Minimum hole diameter = 63.954mm

D) Maximum hole diameter = 64.000 mm, Minimum hole diameter = 63.954 mm

59. Which of the following temperature zones, in relation to the melting point (Tm) of the specified metal on an absolute temperature scale, is meant by the term "hot working" of metals?

A) Room temperature, B) 0.2Tm,

C) 0.4Tm, D) 0.6Tm.

60. Under the suppositions of a perfectly plastic metal, no friction, and no redundant effort, which of the following is the largest decrease that might theoretically be achieved in a wire drawing operation?

A) Zero B) 0.63

C) 1.00 D) 2.72

61. Determine the minimum required coefficient of friction that would roll down a 40 mm thick plate to 30 mm in one pass. Consider entrance speed as 16 mm/min, roll radius as 300 mm, and rotating speed as 18.5 rev/min.

A) 0.1918 B) 0.2351

C) 0.1632 D) 0.1826

62. Cold-rolled steel that is 2.0 mm thick must undergo a blanking procedure. The component has a 75.0 mm diameter and is round. For this process, ascertain the punch and die sizes that are appropriate, where clearance allowance $A_c = 0.075$

A) Punch diameter = 75.3 mm, Die diameter = 75.0 mm

B) Punch diameter = 75.0 mm, Die diameter = 74.7 mm

C) Punch diameter = 74.7 mm, Die diameter = 75.0 mm

D) Punch diameter = 75.0 mm, Die diameter = 75.3 mm

63. Which of the following is equal to the upper control limit in a control chart?

A) Process mean

B) Process mean plus three standard deviations

C) Upper design tolerance limit

D) Upper value of the maximum range R.

64. The setting up of an automatic turning process results in pieces with a mean diameter of 6.255 cm. The output is regularly distributed with a standard deviation of 0.004 cm, and the process is under statistical control. Determine the process capability.

A) The upper and lower limits of the process capability range are: 6.243 to 6.267

B) The upper and lower limits of the process capability range are: 6.247 to 6.263

C) The upper and lower limits of the process capability range are: 6.239 to 6.271

D) The upper and lower limits of the process capability range are: 6.243 to 6.263

65. Which of the following is most closely related with the term kanban?

A) Capacity planning

B) Just-in-time production,

C) Master production schedule

D) Material requirements planning.

66. When items are made-to-stock, the demand is 60,000 units annually. The annual holding cost rate equals 25%, and each unit costs $4.00. This product's setup costs are $300. Find an economical order quantity.

A) 2000 units

B) 3500 units

C) 4500 units

D) 6000 units

67. The XYZ Company's production calendar is on day 15 at this time. At a specific work centre, three orders (A, B, and C) need to be handled. The work centre received the orders in the following order: A-B-C. The production calendar due date and remaining process time for each order are shown in the following table. Determine the sequence of the orders that would be scheduled using least slack time.

Order	Remaining process time	Due date
a.	5 days	Day 25
b.	16 days	Day 34
c.	7 days	Day 24

A) a - c - b

B) c - a - b

C) c - b - a

D) b - c - a

68. Which of the following best describes how a flexible manufacturing system's physical layout is determined?

A) Computer system,
B) Material handling system,
C) Processing equipment,
D) Weight of parts processed.

69. What is the expression for 'a' in the least square method of linear regression forecasting equation y = a+ b x? Note : $\in$ is summation symbol

A) $a = \frac{n \in xy}{\in x^2}$
B) $a = \frac{\in y}{n}$
C) $a = \frac{nxy - \in x . \in y}{n \in x^2 - (\in x)^2}$
D) $a = \frac{\in y - b \in x}{n}$

70. Which of the following best explains the purpose of the GO gauge in a GO/NO-GO gauge?

A) Checks limit of maximum tolerance
B) Checks maximum material condition.
C) Checks Minimum size.
D) Checks minimum material condition.

71. A 2×10^5 W/mm^2 laser beam is used to drill holes in a 0.5 mm thick tungsten sheet. The drill diameter is 200 microns. Estimate the time required to drill a through hole if 3×10^4 joules/cm^3 are required to vaporize. The efficiency might be assumed to be 10%.

A) 0.00075 sec
B) 0.003 sec
C) 0.0003 sec
D) 0.0075 sec

72. A removal rate of 5 cm^3/min is desired in an electrochemical machining process with a pure iron workpiece. Determine the needed current. (Properties of Iron: Gram atomic weight of iron (A) = 48 g, Valency (Z) =2, Density (ρ) = 4.5 g/cm^3 Faraday's constant = 96500 coulombs per mole)

A) 670.13 amps
B) 753.90 amps
C) 3015.6 amps
D) 4612.8 amps

73. Which of the following four bulk deformation processes is associated with Johnson's formula?

A) Bar and wire drawing

B) Extrusion

C) Forging

D) Rolling

74. In an EBW (Electronic beam welding) operation, the voltage is 50 kV and the beam current is 65 milliamps. The electron beam is focused on a 0.3 mm diameter circular region. $f_1 = 0.85$ for heat transfer efficiency. Determine the average power density in the area in watt/mm^2

A) 39074 Watt/mm^2

B) 45969 Watt/mm^2

C) 54082 Watt/mm^2

D) 9768.5 Watt/mm^2

75. Which of the following categories is typically included in the master production schedule? (i) Spare tires, (ii) Firm customer orders, (iii) Orders for maintenance and spare parts, (iv) General product lines, (v) Sales forecasts, and (vi) Components used to build the final products.

A) ii, iii, v only

B) ii, iv, vi only

C) i, iii, v only

D) i, iv, vi only

76. Which of the following materials is most commonly used to make a surface plate?

A) Aluminium oxide ceramic

B) Cast iron

C) Granite

D) Stainless steel

77. The workpiece in a production turning operation is 125 mm in diameter and 300 mm in length. In the procedure, a feed rate of 0.225 mm/rev is used. Work piece loading time 3 min and unloading time is 1 min and if the cutting speed is 3.0 m/s determine total time taken to complete 5 such workpieces.

A) 34.5 min
B) 29.5 min
C) 14.5 min
D) 19.5 min

78. In a reversing two-high mill, a series of cold rolling operations will be performed to reduce the thickness of a plate from 50 mm to 25 mm. The roll diameter is 700 mm, and the coefficient of friction between the rollers and the work is 0.15. The draught must be equal on each pass, according to the standard. Determine the bare minimum of passes required.

A) 3 passes
B) 4 passes
C) 5 passes
D) 6 passes

79. A rough machined surface of 80 x160 mm^2 with 10 teeth over a face milling cutting of diameter 150 mm. If the cutter centre is aligned with workpiece line of symmetry, estimate the time to rough machine the surface if the feed per tooth is 0.25 mm and the cutting speed is 20 m/min and cutter have 5 mm of approach and 5 mm of overrun.

A) 5.03 min
B) 4.02 min
C) 3.01 min
D) 2.26 min

80. Which of the following part design characteristics are most likely to be included in a parts classification and coding system? (i) Part dimensions, (ii) Major process, (iii) Length-to-diameter ratio, (iv) Batch size, (v) Annual production and (vi) Tolerances.

A) ii, iii only
B) i, ii, vi only
C) i, iii, v only
D) i, iii, vi only

81. It is planned to replace the fire brick with thermal conductivity k = 0.72 W/mK and thickness 0.6 m, with a new refractory material with thermal conductivity of k = 0.18 W/mK. For the same amount of heat loss and temperature drop, the thickness of the new refractory material should be

A) 0.06 m
B) 0.12 m
C) 0.15 m
D) 0.24 m

82. When a Fluid is flowing over a flat plate, the viscous effect of the fluid

A) Is confined in the potential flow

B) Is confined inside the boundary layer

C) Is confined outside the boundary layer

D) Is found on the turbulent core

83. In a shower unit hot water enters at 15 °C at the rate of 5 kg/min and cold water enters at 65 °C at the rate of 3 kg/min. Taking the C_p of water as 4.18 kJ/kg °C the exit temperature of the mixture is15°

A) 24.25

B) 33.75

C) 40.25

D) 48.75

84. The ignition quality of diesel fuel is indicated by

A) Octane number

B) Cetane Number

C) Fire point

D) Flash point

85. A refrigerating machine working on a reversed Carnot cycle takes out 3 kW/min of heat from the system, between temperature limits of 500 K and 300 K. The COP and the power consumed by the cycle respectively be

A) 1.5 and 2 kW/min

B) 1.5 and 3 kW/min

C) 2.5 and 2 kW/min

D) 2.5 and 3 kW/min

86. One Ton of Refrigeration is equal to

A) 1.5 kW

B) 2.5 kW

C) 3.5 kW

D) 4.5 kW

87. At choking condition, the Mach Number (Ma) at the throat of a Convergent-Divergent nozzle is

A) $Ma < 1$

B) $Ma = 1$

C) $Ma > 1$

D) $Ma >>> 1$

88. To achieve sensible heating, air is passed through a heating coil at a temperature of 40 °C The inlet air has a temperature of 10 °C and if the outlet temperature of air is 25 °C then the efficiency of the coil is

A) 35%

B) 50%

C) 70%

D) 85%

89. A copper ball of diameter 90 mm, at a temperature of 75 °C is heated to an average temperature of 240 °C The average specific heat and density of the copper ball is assumed to be 0.4 J/gmK and 8.4 g/cm^3.Evaluate the amount of energy that needs to be transferred to the copper ball.

A) 317.4 kJ

B) 211.6 kJ

C) 317.4 J

D) 211.6 J

90. A freshly cooked spherical potato (K = 0.45 W/mK) of 12 cm diameter at 40 °C is air cooled (h = 24.8 W/m^{2}K) with cold air (10 °C) at 1m/s. The combined heat transfer coefficient Determine the initial value of temperature gradient in the potato at the surface (°C/m)

A) 1233.33

B) 1443.33

C) 1653.33

D) 1863.33

91. A counterflow shell and tube heat exchanger is used to heat water with exhaust gases. The water (c = 4180 J/kgK) flows at the rate of 2.5 kg/s and the flue gases (c = 1250 J/kgK) flows at a rate of 3.5 kg/s. With a heat transfer area of 36 m^2 and overall heat transfer coefficient of 250 W/m^2K, the NTU of the heat exchanger is

A) 0.61
B) 0.86
C) 2.06
D) 2.88

92. A heat engine with 33 % thermal efficiency and 66 % second law efficiency, rejects heat to a sink at 52 °C The temperature of the source is

A) 485 K
B) 650 K
C) 850 K
D) 955 K

93. An aircraft is flying at a speed of 450 m/s, If the temperature of the surrounding air is 300 K and the specific heat ratio (γ) = 1.5. Given the gas constant of air (R) is 0.2 kJ/kgK, the value of Mach number is

A) 1
B) 1.5
C) 2
D) 2.5

94. NOx emissions in SI Engines are maximum when the air-fuel ratio is

A) Nearly Stoichiometric
B) Lean
C) Rich
D) None of the above

95. 315 kJ of work is extracted from an engine working on Otto cycle which has a compression ratio of 9. Given that specific heat ratio (γ) = 1.5, the amount of heat rejected by the cycle in kJ is

A) 160 kJ

B) 240 kJ

C) 480 kJ

D) 520 kJ

96. A 34 kW engine has a mechanical efficiency of 85 %. If the frictional power is assumed to be constant with load, then the mechanical efficiency at 60 % of the load is

A) 45.28 %

B) 57.61 %

C) 77.27 %

D) 86.12 %

97. For a refrigerator working on Carnot vapor Refrigeration cycle and operating between 357 °C and 27 °C Find the net work done given the enthalpy at the end of expansion is 60 kJ/kg and the enthalpy at the start of compression is 170 kJ/kg.

A) 100 kJ/kg

B) 121 kJ/kg

C) 154 kJ/kg

D) 200 kJ/kg

98. The efficiency of the Carnot engine is 50 %. The COP of the Carnot refrigerator is

A) 0.5

B) 1

C) 2

D) 2.5

99. Air in a Storage facility is at 30 °C and 70 % Relative Humidity. The pressure in the facility is 0.15 MPa. The saturation pressure of water at 30 °C is 7 kPa. The humidity ratio of air in gram/kg of dry air is

A) 2 B) 16

C) 21 D) 34

100. For an Impulse turbine operating at 4200 rpm and mean diameter of 0.28 m, the mean blade velocity is

A) 30.8 m/s

B) 46.2 m/s

C) 61.6 m/s

D) 82.4 m/s

101. In the pressure compounding of an impulse turbine, the total enthalpy drop is

A) Taking place in the first stage

B) Divided equally in among all stages

C) Divided unequally where there is more drop in the first stage

D) None of the above

102. In a power plant operating on a Rankine cycle, the enthalpy at the entry and exit of the turbine is 3510 kJ/kg and 1500 kJ/kg. If the specific pump work is 10 kJ/kg, then the Specific Steam Consumption in kg/kWh is

A) 1.2 B) 1.5

C) 1.7 D) 1.8

103. If the temperature of the gas is represented by T and the Molecular Weight of the gas is represented by MW then the thermal conductivity of the gas will increase when

A) Both T and MW decrease B) T decreases and MW increases

C) Both T and MW increase D) T increases and MW decreases

104. Consider 2 large concentric cylinders of diameters 10 cm and 18 cm. Radiation heat transfer is occurring at the annulus between the two cylinders. The radiation view factor of the outer cylinder onto itself is

A) 0.178

B) 0.309

C) 0.444

D) 0.822

105. A very large plane wall having an area of 60 m^2 whose left side is at a temperature of 90 °C with the thickness of the wall being 20 cm. The thermal conductivity of the plane wall is 2.3 W/mK. The surroundings at the right surface is at 25 °C with an average convection heat transfer coefficient h = 24W/m^2 °C Determine the rate of heat conduction through the wall. (Assume 1-D steady state heat transfer)

A) 43,321 W

B) 35,321W

C) 30,321 W

D) 27,321 W

106. An electric water heater of 220 V uses an electric heating element of 1 cm diameter and 0.85 m long of thermal conductivity K = 0.85 W/mK for heating by natural convection. After some time, the temperature of the heating element is 150 °C and the temperature of water is 35 °C The Nusselt number based on diameter is 6. Considering only the side surface of the heater ($A = \pi DL$), the current passing through the electric resistance element is

A) 7.12 A

B) 10.12 A

C) 13.56 A

D) 16.56 A

107. A steel pipe (K = 100 W/mK) is carrying hot fluid at 220 °C, with internal and external diameter 0.2 m and 0.24 m respectively. It is insulated with glass wool (K = 0.07 W/mK) of thickness 2.4 cm. The heat transfer coefficient at the inner surface is 80 W/m^2K. If the interface is at a temperature of 214 °C, the temperature at the outer surface of the insulation is (Take $\ln(r_2/r_1) = 0.1823$)

A) 20.2 °C

B) 40.2 °C

C) 60.2 °C

D) 90.2 °C

108. A cylindrical Copper rod of diameter 6 cm and length 8 cm, with a surface emissivity $\varepsilon = 0.65$, is at a temperature of 1200 K. In 15 minutes, the total amount of radiation emitted by all the surfaces is

A) 678 kJ

B) 993 kJ

C) 1246 kJ

D) 1424 kJ

109. 0.7 kg/s of cold air ($c_p = 1000$ J/kgK) entering a balanced counter flow heat exchanger system at 275 K is to be preheated by the same amount of hot air entering the system at 298 K. For an area of 32 m^2 and with a estimated overall heat transfer coefficient of 30 W/m^2K, the outlet temperature of the preheated air is

A) 278.3 K

B) 283.5 K

C) 288.3 K

D) 293.5 K

110. A completely reversible heat pump with a sink temperature of 420 K, has a COP of 1.8. If 1.6 kW of power is supplied to the heat pump, then the temperature of source (K) and the rate of heat transfer (kW) to the sink respectively are

A) 152.34 and 1.44

B) 152.34 and 2.88

C) 186.67 and 1.44

D) 186.67 and 2.88

111. A spherical air balloon initially of 4 m diameter (120 kPa and 293 K), is filled with air at 120 kPa and 20 °C with a velocity of 2.5 m/s through a 1.335 m diameter opening. If the pressure and temperature of the air in the balloon remain same during the filling process then determine the time taken to inflate the balloon to 18 m diameter in minutes (Take R = 0.28701 $kPa.m^3/kg.K$)

A) 2.80 min

B) 6.95 min

C) 14.38 min

D) 22.76 min

112. A 60 kg block of iron at 297 °C is thrown into a large lake, at a temperature of 12 °C The iron block eventually reaches thermal equilibrium with the lake water. Given that the average specific heat for iron is 0.5 kJ/kgK, the entropy generated during this process is (kJ/K)

A) 5.79

B) 9.21

C) 35.21

D) 50.79

113. 40 kW is the power delivered by a four-stroke SI engine at full load. 10kW is required to rotate it, without any load at the same speed. At full load if the brake thermal efficiency is 25%. The calorific value of fuel is 44 MJ/kg and specific gravity of the fuel is 0.8. The fuel consumption (kg/s) and the indicated thermal efficiency at full load is

A) 1.68×10^{-3} and 25.75 %

B) 1.68×10^{-3} and 31.25 %

C) 3.36×10^{-3} and 25.75 %

D) 3.36×10^{-3} and 31.25 %

114. An engine working on the Otto cycle has a cylinder of diameter 200 mm and stroke 280 mm. The clearance volume of the engine is 1100 cc. Taking $C_p = 1.005$ kJ/kg.K and $C_v = 0.67$ kJ/kg.K for air. The air-standard efficiency of the engine is

A) 25 %

B) 33.34 %

C) 66.67 %

D) 75 %

115. For Octane rating the reference fuels are

A) 2,2,4-Trimethylpentane and n-heptane

B) Iso-octane and α -methyl naphthalene

C) Iso-octane and Tetraethyl lead

D) Iso-octane and cetane

116. Air in an Operation Theatre is at 25 °C and the atmospheric pressure is 100 kPa. The saturation pressure of water at 25 °C is 10 kPa. Find the relative humidity given that degree of saturation is 0.8.

A) 0.816 B) 0.581

C) 0.382 D) 0.184

117. During the process of sensible cooling the

A) Wet bulb temperature (WBT) increases and Dew point temperature (DPT) remains same

B) Wet bulb temperature (WBT) decreases and Dew point temperature (DPT) remains same

C) Wet bulb temperature (WBT) remains same and Dew point temperature (DPT) decreases

D) Wet bulb temperature (WBT) remains same and Dew point temperature (DPT) increases

118. Which among the following statements is not true when the evaporator pressure is decreased in vapor compression refrigeration system

A) The compressor work is increased

B) The COP of the system is decreased

C) The Refrigeration Effect is decreased

D) The volumetric efficiency of the compressor is increased

119. At optimum velocity ratio, and neglecting energy losses to friction in an impulse turbine the blading efficiency is given as

A) $\sin^2 \alpha$

B) $\cos^2 \alpha$

C) $\tan^2 \alpha$

D) None of the above

120. Two cyclic plants operate in parallel, one on the Brayton cycle with efficiency $\eta_1 = 60\,\%$ and the other on the Rankine cycle with efficiency $\eta_2 = 35\,\%$. The overall efficiency of the combined cycle

A) Is sum of the efficiencies of the two cycles

B) Lies between the efficiencies of the two cycles

C) Product of the efficiencies of the two cycles

D) Is the sum of the efficiencies of the two cycles subtracted by the product of the efficiencies of the two cycles.

ROUGH WORK

ROUGH WORK

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

Booklet Serial No.

Test Booklet Series

TEST BOOKLET
ARCHITECTURE
Written Test - 2023
(14, 15, 16)

A

Time Allowed: Three Hours ***Maximum Marks: 120***

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside.

   DO NOT* write *anything else on the Test Booklet.
4. This Test booklet contains **120** items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer /Response Sheet provided. *See directions in the Response Sheet.*
6. ***All*** items carry equal marks.
7. Before you proceed to mark in the Answer /Response Sheet, the response to various items in the Test Booklet, you have to fill in some particulars in the Answer /Response Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer /Response Sheet.*** You are permitted to take away with you the Test Booklet and ***Candidate's Copy of the Response Sheet .***
9. Sheets for rough work are appended in the Test Booklet at the end.
10. While writing Centre, Subject and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN".**
11. **Penalty for wrong answers:**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).

    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **(0.25)** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

1. The elements of design are ;

Choose the appropriate answer

A) Point, Line, Plane/Shape, Volume/ form.
B) Point, Line, Plane/Shape, Volume/ form, Tone, Texture.
C) Point, Line, Plane/Shape, Volume/ form, Tone, Texture, Colour, Letterform.
D) Point, Line, Plane/Shape, Volume/ form, Tone, Texture, Colour.

2. Complementary Colours are;

Choose the correct answer

I. Known as Contrasting colours
II. Positioned opposite each other on the colour wheel.
III. Creates, Tension, vibrancy and contrast.
IV. Creates, Harmony, smoothness and similarity.
A) I, II, IV are correct whereas III is incorrect.
B) I, II, III are correct whereas IV is incorrect.
C) Only I and II are correct whereas III and IV are correct.
D) All I, II, III, and IV are correct

3. The most appropriate definition of Anthropometry is;

Choose the correct answer

I. The measurement of spaces in architecture.
II. The measurement of size and proportions of human body.
III. The measurement of clearances of human body.
A) I is correct, II and III are incorrect.
B) II and III are correct, and I is incorrect.
C) All I, II and III are correct.
D) II is correct whereas I and III is incorrect.

4. The principle of balance is defined as;

I. Arrangement of elements in a composition to show opposition and contrast.
II. A sense of visual weight that is unequal.
III. A sense of visual weight that is equal.
IV. A repetition to achieve a composition.
A) Only III is correct, whereas I, II and IV are incorrect.
B) Only IV is correct, whereas I, II and III are incorrect.
C) I, II, III and IV all are correct.
D) III and IV are correct whereas I and II are incorrect.

5. A pattern is created through;

A) Applying rendering to a flat shape.
B) Changing contrast in an image.
C) Using repetition or alteration of elements.
D) Changing the size of an element.

6. The secondary colours are;

A) Red, Blue, Yellow.

B) Orange, Purple, Green

C) Violet, Indigo, Blue

D) Green, Yellow, Red

7. Art Nouveau is;

A) French, for "New Art", a style of decoration and Architecture, started in Paris in 1890s.

B) French, for "New Art", a style of decoration and Architecture, started in Marseille in 1790s.

C) Italian, for "New Art", a style of decoration and Architecture, started in Rome in 1890s.

D) Italian, for "New Art", a style of decoration and Architecture, started in Venice in 1790s.

8. Bauhaus movement an important design movement;

A) Took place in Italy, in 1920's , which means "Building House".

B) Took place in France, in 1920's, which means "Building Huts".

C) Took place in Germany, in 1920's which means "Building School".

D) Took place in Spain, in 1920's which means "Building Hotels".

9. In Isometrics;

A) The three major axis makes different angles with the picture plane.

B) Two of the three major axis makes equal angles with the picture plane.

C) The three major axis makes an angle of 30 degree among themselves.

D) The three major axis make equal angles with picture plane

10. Architecture is Defined by Francis DK Ching in terms of;

A) To Receive - To Design - To build

B) To Conceive - To Design and Realize - To Build

C) To Receive - To Construct - To Build

D) To Conceive - To Realize - To Build

11. In Orthographic Projection;

A) The projectors are inclined to the picture plane and the principal face in each projection (i.e. plan and elevations) is oriented parallel to the picture plane.

B) The projectors are perpendicular to the picture plane and the principal face in each projection (i.e. plan and elevations) is oriented inclined to the picture plane.

C) The projectors are parallel to the picture plane and the principal face in each projection (i.e. plan and elevations) is oriented inclined to the picture plane.

D) The projectors are perpendicular to the picture plane and the principal face in each projection (i.e. plan and elevations) is oriented parallel to the picture plane.

12. In Oblique Projection;

A) The projectors are parallel to each other and oblique to the picture plane.

B) The projectors are oblique to each other and oblique to the picture plane.

C) The projectors are perpendicular to each other and oblique to the picture plane.

D) The projectors are oblique to each other and perpendicular to the picture plane.

13. If a 3000 sq. ft. building is standing on a 1000 sq. ft. plot the ;

A) FSI will be 300% and FAR will be 3

B) FAR will be 300% and FSI will be 3

C) FAR and FSI will be 3.0

D) None of the above.

14. Abbreviation UNCRPD stands for;

A) United Nations Convention for Rights to People with Disabilities.

B) United Nations Convention for Rights to Persons with Diversity.

C) United Nations Conventions on the Rights to People with Diseases.

D) United Nations Convention on the Rights of Persons with Disabilities

15. The "Sugamya Bharat Abhiyaan" (Accessible India Campaign) an initiative by "Department of Empowerment of Persons with Disabilities" (DEPwD), Ministry of Social Justice and Empowerment, was launched by Shri _____.

A) Narendra Modi in the Year 2014.

B) Thawarchand Gehlot in the Year 2015.

C) Narendra Modi in the Year 2015.

D) Thawarchand Gehlot in the Year 2016.

16. How many types of disabilities are listed in the PwD Act 2016, of India?

A) 04

B) 08

C) 21

D) 27

17. _____ is the design of products and environments usable by all people without adaptation or specialized design.

A) Barrier Free Design

B) Adaptive Design.

C) Assistive Design.

D) Universal Design

18. Which of the following are principles of Universal Design

I. Simple and Intuitive Use.

II. Perceptible Information.

III. Tolerance for Error.

IV. Size and Space for Approach and Use.

A) All the above

B) I, II, and III only

C) II, III and IV only

D) None of the above

19. A perspective projection portrays;

A) A three dimensional form or construction by projecting all of its points to a picture plane (PP) by straight lines that diverge from a fixed point representing the plane of the observer.

B) A three dimensional form or construction by projecting all of its points to horizon by inclined lines that are projected to diverge representing double eye of the observer.

C) A two dimensional form or construction by projecting all of its points to a horizon plane by straight lines that converge at various points representing a single eye of the observer.

D) A three dimensional form or construction by projecting all of its points to a picture plane (PP) by straight lines that converge at a fixed point representing a single eye of the observer.

20. A contour line is;

A) An imaginary line joining points of unequal elevation above ground surface.

B) An imaginary line joining points of equal elevation above ground surface.

C) An existing line joining points of unequal elevation on a ground surface.

D) An imaginary line joining points of equal elevation on a ground surface.

21. Paraline drawings includes; (choose the correct answer)

A) A subset of perspective projections known as orthographic projections as well as the entire class of oblique projections.

B) A subset of orthographic projections known as axonometric projections as well as the entire class of oblique projections.

C) A subset of oblique projections known as orthographic projections as well as the entire class of perspective projections.

D) All of the above

22. The Elevation Obliques orient; (Choose the correct answer)

A) A particular vertical face or set of vertical planes parallel to the picture plane and therefore reveal their true sizes, shapes, and proportions.

B) A particular horizontal face or set of horizontal planes inclined to the picture plane and therefore reveal their true sizes, shapes, and proportions.

C) A particular inclined face or set of inclined planes parallel to the picture plane and therefore reveal their foreshortened sizes, shapes, and proportions.

D) A particular vertical face or set of vertical planes inclined to the picture plane and therefore reveal their foreshortened sizes, and proportions.

23. Consider the following Statements:

I. Bearing is a horizontal angular direction expressed in degrees east or west of a standard north or south direction.

II. Azimuth is a horizontal angular distance, measured clockwise, of a bearing from due north

III. Altitude is the angular elevation of the sun above the horizon.

A) I and II are correct whereas III is Incorrect

B) II and III are correct whereas I is Incorrect

C) I and III are correct whereas II is Incorrect

D) I, II and III, all are correct.

24. For the study of sciography, sunrays are considered parallel to each other and at an angle exactly matching the solid diagonal of a cube;

The angle of the solid diagonal of a cube is

A) 33 degrees and 12'

B) 35 degrees and 16'

C) 37 degrees and 16'

D) 35 degrees and 12'

25. Consider the following Statements:

I. English bond consists of alternate courses of headers and stretchers

II. Flemish bond consists of alternate headers and stretchers in each course.

III. Single Flemish bond consists of a facing of Flemish bond and backing of English bond in each course.

IV. Double Flemish bond shows characteristic appearance of Flemish bond on both side.

A) I, II and IV are correct whereas III is incorrect.

B) I, II and III are correct whereas IV is incorrect.

C) II, III and IV are correct whereas I is incorrect.

D) All the above are correct.

26. Timber roof are classified as;

A) Single roof, Double roof, Trussed roof and Triple or framed roof.

B) Flat roof, Lean to roof, Double lean to roof

C) Couple roof, Close couple roof and Collar roof.

D) None of the above.

27. Flashing in roofing is;

A) A flat, thin piece of wood used to help waterproof the edges and protrusions of roofing systems.

B) A flat, thin piece of felt used to help waterproof the ridges and valleys of roofing systems.

C) A flat, thin piece of metal used to help waterproof the perimeter and protrusions of roofing systems.

D) A flat, thin piece of rubber used to help waterproof the ridges and valleys of roofing systems.

28. In M10, M15, M20 grade of concrete

A) M denotes the mix of a specific ratio of Cement, Sand and coarse aggregate whereas the numerical value is the compressive strength of the mix.

B) M denotes the mortar of a specific ratio of Cement, Sand, coarse aggregate and water whereas the numerical value is the number of days required for setting.

C) M denotes the mortar of a specific ratio of Cement, lime and coarse aggregate whereas the numerical value is the strength of coarse aggregate.

D) M denotes the mix of a specific ratio of Cement, Sand and stones whereas the numerical value is the compressive strength of the mix.

29. A work triangle in a kitchen is;

A) Formed by connecting the corner fronts of the sink, range and the refrigerator. The some of the sides of the work triangle should not exceed 21 feet.

B) Formed by connecting the center back of the sink, range and the refrigerator. The some of the sides of the work triangle should not exceed 22 feet.

C) Formed by connecting the edge of the sink, range and the refrigerator. The some of the sides of the work triangle should not exceed 24 feet.

D) Formed by connecting the center fronts of the sink, range and the refrigerator. The some of the sides of the work triangle should not exceed 23 feet.

30. Ashlar is a class of masonry;

A) Consists of blocks of random rubbles which is built to courses.

B) Consists of random rubbles built to courses with through stones.

C) Consists of blocks of random rubble un-coursed with irregular courses

D) Consists of blocks of accurately dressed stone with extremely fine bed and end joints.

31. A Rake in Timber roof is;

A) The sloped sides of the roof which forms the valley for draining the rain water.

B) The sloped sides of a gable end, the exposed part of a gabled roof that extends from an eave to the ridge of the roof's sloped sides.

C) The top covering provided at the ridge of roof for the rain water protection.

D) The flat surface of the roof, the exposed part that extends from a gutter to the ridge of the roof.

32. In an arch the Intrados and abutments is ;

A) The external curve of the arch and the horizontal portion of wall that support the arch.

B) The outer curve of the arch and the portion of cornice that support the arch.

C) The inner curve of the arch and the portion of wall that support the arch.

D) The outer curve of the arch and the portion of key stone that holds the arch.

33. A Spandrel is ;

A) The inner semi-circular space inside the intrados.

B) The area between the intrados and extrados of an arch.

C) The inner vertical surface of the wall that supports the base of the arches.

D) A triangular walling enclosed by the extrados and the horizontal line between the two crowns, when arches adjoin.

34. As per standards, the slope for soil line from WC to the sewers is

A) 1: 300

B) 1: 200

C) 1: 100

D) 1: 50

35. Consider the following Statements:

I. Granite is an example of igneous rock.

II. Marble and slate is an example of Sedimentary rock.

III. Lime stone and sand stone is an example of metamorphic rock.

A) I and II is correct whereas III is incorrect

B) I and III is correct whereas II is incorrect

C) II and III is correct whereas I is incorrect

D) II and III is incorrect whereas I is correct

36. In first angle projection;

A) The object is placed between observer and picture plane and the projectors are inclined to each other and parallel to the picture plane.

B) The object is placed behind the picture plane and the projectors are parallel to each other and inclined to the picture plane.

C) The object is placed between observer and picture plane and the projectors are parallel to each other and perpendicular to the picture plane.

D) None of the above.

37. The theory of "Ekistics" was given by;

A) Contrantinos Apostolougas Doxiadis

B) Constructinos Apostolou Doxiadis

C) Constrantino Apostolougas Doxiadis

D) Constantinos Apostolou Doxiadis

38. Consider the following Statements:

I. The Egyptian civilization grew only on one side of the river as the river Nile was very wide for navigation.

II. In Roman civilization, water was brought from faraway places by means of aqueducts.

III. The Greek cities were dominated by Zigurats which were sometimes 8 stories high.

A) I and II are correct whereas III is Incorrect.

B) I and III are correct whereas II is Incorrect.

C) II and III are correct whereas I is Incorrect.

D) I, II and III all are correct.

39. In Mohenjodaro;

I. There was no fortification and the major streets were laid in north-south direction.

II. Instances of arches has been discovered.

III. Buildings ranged from two rooms to mansions of many rooms.

A) I and II are correct whereas III is Incorrect.

B) I and III are correct whereas II is Incorrect.

C) II and III are correct whereas I is Incorrect.

D) I, II, and III all are correct.

40. The Garden City Movement was initiated by;

A) Lewis Mumford in 1898

B) Duckworth Geddes in 1918

C) Patrick Geddes in 1898

D) Ebenezer Howard in 1898

41. The Linear city concept was given by;

A) Ludwig Hilbersemier in 1880

B) Tony Garnier in 1882

C) Soria Y. Mata in 1882

D) Le Corbusier in 1880

42. The concept of Broad Acre was given by

A) Frank Lloyd Wright.

B) Ludwig Hilberseimer

C) Lewis Mumford

D) Patrick Geddes

43. The plan of Jaipur was made by

A) Maharana Vijay Singh assisted by Shridhar Bhattacharyya.

B) Maharana Jaisingh and assisted by Vidyadhar Bhattacharyya

C) Maharana Pratap assisted by Gajodhar Bhattacharyya

D) Maharana Gajsingh and assisted by Uttrottar bhattacharyya

44. The five principle kingdoms which ruled in the south of India are;

A) Ashoka - Chola - Pandya - Pallava - Madura.

B) Shunga - Chola - Pallava - Pandya - Madura

C) Ashoka - Chola - Pandya - Dravida - Madura.

D) Pallava- Chola - Pandya - Vijaynagar - Madura.

45. The five elements of Ekistics are;

A) Nature, Anthropos, Society, Shells and Networks

B) Land, Air, Fire, Earth, and wind.

C) Nature, Man, People, buildings, and Networks

D) Nature, People, Buildings, Transportation, and Networks

46. Right of Way (ROW) is

A) The horizontal distance from one plot line to the edge of the road.

B) The longitudinal distance from one plot line to another plot line in front of it.

C) The horizontal distance from one plot line to another plot line in front of it.

D) The horizontal distance from one plot line to the edge of the road of another plot in front of it.

47. Multiple Nuclei Theory was given by;

A) Charles Harris and Weber in 1947

B) Charles Harris and Ullman in 1947

C) Chauncy Harris and Weber in 1945

D) Chauncy Harris and Ullman in 1945

48. Sector theory of city was given by;

A) Homer Hoyt in 1939

B) Homer Hoyt and Haris burgess in 1939

C) Homer Hoyt and Haris burgess in 1949

D) Balmer Boyt in 1939

49. How much is per person water supply for office buildings as per NBC 2016?

A) 45 L per head per day

B) 135 L per head per day

C) 150 L per head per day

D) 70 L per head per day

50. What is the function of wash out valve in water distribution system?

A) Distribute water to distribution pipes

B) Receive water from supply pipe

C) To drain out water from tank for cleaning & maintenance

D) To share water with fire fighting tank

51. The factor that causes head loss in gravity system of water supply is?

A) Reduction in diameter of pipe.

B) Increase in length of pipe.

C) Insoluble pollutants in water

D) Friction

52. How much is the minimum area of all new construction that requires to incorporate rain water harvesting system and sullage recycle system as per National Building Code 2016?

A) 1000 sq. Feet

B) 1000 sq. m

C) 10000 sq. m.

D) 1200 sq. Feet

53. Gully trap is provided at the following location:

A) Sink and floor

B) Junction between house drain and sewer connection

C) Floor and vertical pipe

D) WC and sewer pipe

54. The 3R approach of solid waste management stands for:

A) Redevelop, Refine and Reuse

B) Remove, Recycle and Refine

C) Remove, Regenerate and Refine

D) Reduce, Reuse and Recycle

55. The recommended handling capacity of lift for *Mid End* Residential buildings as per NBC 2016 in handling capacity (percentage) is

A) 8-10

B) 6-8

C) 4-6

D) 2-4

56. The maximum travel distance of fire exit from any given point in a fully sprinkled *Educational building is*

A) 22.5 m

B) 30 m

C) 15 m

D) 25 m

57. An educational building has built up area of 8400 sq. m. on the first floor. Calculate the minimum width (in meters) of fire staircase required as per NBC 2016.

Occupant Load Factor (sq. m/ person) = 4

Capacity Factor (width per person in mm) = 10

A) 21

B) 3.36

C) 33.6

D) 8.4

58. The minimum width of fire staircase for Institutional buildings as per NBC 2016 is

A) 1.25 m.

B) 1.5 m.

C) 1.75 m

D) 2.0 m

59. The internal temperature range (in °C) that human body needs to maintain for effective functioning is

A) 35.5-36.1 °C

B) 36.1-37.2 °C

C) 37.2-37.9 °C

D) 37.9-38.5 °C

60. The minimum Fire rating of doors required for fire staircase as per NBC 2016?

A) 90 minutes

B) 100 minutes

C) 120 minutes

D) 150 minutes

61. Critical Path Method is

A) Event based

B) Activity based

C) Both (A) and (B)

D) None of the above

62. Security deposit is

A) This is compulsory to be deposited before entering into a contract.

B) The amount depends on the tendered amount

C) This is refundable after the maintenance period is over.

D) All of the above

63. What is the full form of WBS?

A) Work Based Structure

B) Work By Structure

C) Work Breakdown Structure

D) None of the above

64. What are the different perspectives on risk

A) Stand-alone risk

B) Firm risk

C) Systematic risk

D) All of the above

65. The premium payments for an insurance policy is an example of

A) Net Present Value

B) Cash Flow

C) Annuity

D) IRR

66. Match the following

(i)	Cost Variance	1)	BCWP-BCWS
(ii)	Schedule Variance in cost terms	2)	BCWP- ACWP
(iii)	Cost Performance Index	3)	BCWP/BCWS
(iv)	Schedule Performance Index	4)	BCWP/ACWP

A) (i) 2,(ii)1,(iii)4,(iv)3
B) (i) 1,(ii) 2,(iii) 4, (iv)3
C) (i)4, (ii)3,(iii)2, (iv) 1
D) (i) 1,(ii) 2,(iii)3, (iv) 4

67. Network diagrams are an improvement over the milestone charts.
A) No
B) Yes
C) Can't say
D) None of the above

68. Calculate the volume of the concrete in a beam whose depth is 250mm, width 300mm and length of the beam is 3 metre.
A) 22.50 Cu.m
B) 2.25 Cu.m
C) 2250 Cu.m
D) 0.225 Cu.m

69. Are milestones chart are the modifications over the original Gantt chart.
A) Yes
B) No
C) Don't know
D) None of the above

70. Crashing an activity refers to taking special costly measures to reduce the duration of an activity below its normal value. These special measures might include using overtime, hiring, additional help, using saving materials etc.
A) Yes
B) No
C) Don't know
D) None of the above

71. Slack is known as the

A) Difference between the latest time and the earliest unexpected time.

B) Difference between the latest allowable time and the earliest expected time of an event.

C) None of the above

D) Both (A) and (B)

72. _____ is an amount of compensation payable by a contractor to the owner or Government due to delayed construction having no relationship with real damage?

A) Security deposit

B) Retention money

C) Unliquidated damage

D) Liquidated damage

73. Every area, beginning at the limit of prohibited area in respect of every ancient monument and archaeological site and remains Regulated Area up to a distance of ?

A) 100m

B) 200m

C) 300m

D) 400m

74. India's first UNESCO World Heritage city is?

A) Jaipur

B) Ahmadabad

C) Old Delhi

D) Ujjain

75. What all things are *NOT* allowed in Prohibited Area around Ancient Monuments and Heritage sites in India as per AMSAR Act?

(i) New Construction

(ii) Industrial Activity

(iii) Public Gathering

(iv) Metro construction

A) (i), (ii), (iii)

B) (i), (iii), (iv)

C) (i), (ii), (iv)

D) (iv), (iii), (ii)

76. The five elements mentioned by Kevin Lynch that constitutes image of a city do *NOT* include?

(i) Paths (ii) Nodes (iii) Market (iv) Intersections

A) Both (i) and (ii)

B) Both (ii) and (iii)

C) Both (iii) and (iv)

D) Both (i) and (iv)

77. How much is the suggestive population density for Large cities in Hill Areas as per URDPFI Guidelines (in persons per hectare)?

A) 60-90

B) 100-150

C) 125-175

D) 175-200

78. The proponent of Vertical Theory of Urban Design is

A) Peter Hall

B) Kevin Lynch

C) Ken Yeang

D) Paul Oliver

79. The concept of 'serial vision' was proposed by

A) Gordon Cullen

B) Kevin Lynch

C) Jane Jacobs

D) I.M. Pei

80. The total built up area of a site is 3500 sq. m, FAR is 3.0 and maximum permissible Ground Coverage is 50%. In this case the minimum number of floors required for complete utilization of FAR is

A) 6

B) 8

C) 5

D) 7

81. Which of the following is NOT a Land use category as per URDPFI guidelines?

(i) Recreational

(ii) Garden

(iii) Commercial

(iv) Sports

(v) Transport and Communication

(vi) Industrial

A) (i) and (iii)

B) (i) and (v)

C) (v) and (vi)

D) (ii) and (iv)

82. The study of formation and transformation of Urban form, process and agents is called

A) Urban Texture

B) Urban Grain

C) Urban Morphology

D) Urban Sprawl

83. Building Bye-laws does *NOT* impact the following aspects of a building design.

(i) Floor finish

(ii) External Paint colour

(iii) Distance of building from the site boundary

(iv) Staircase width

A) (i) and (iii)

B) (iii) and (iv)

C) (ii) and (iv)

D) (i) and (ii)

84. Every area around a protected monument or area comes under prohibited area upto a distance of ?

A) 100m

B) 200m

C) 300m

D) 400m

85. Urban Sprawl is defined by

A) Re-densification of inner core of cities

B) Growth of slum areas on government land

C) Growth of Unauthorized settlement in planned area

D) Unplanned linear development of houses, shops and infrastructure beyond municipal boundaries along transportation line

86. Transit Oriented Development is achieved by

A) Increasing FAR near public transport station

B) Proposing development along Roads

C) New development in outskirts of cities

D) Controlling FAR in core areas of city

87. In the field of GIS application, DEM is useful in

A) Hydrological Studies

B) Vegetation Cover

C) Topography

D) Land cover

88. GIS application in the field of urban planning is useful

A) Relating socio- economic data to geographical locations

B) 3 D visualization of cities

C) Primary survey

D) Conducting participatory meetings

89. The operational guidelines on Credit Linked Subsidy Scheme for Economically Weaker Sections (EWS), January 2017, by the erstwhile Ministry of Housing & Urban Poverty Alleviation, Government of India, defines EWS households as those having an annual income up to _____ (in Indian Rupees).

A) 2,50,000

B) 8,00,000

C) 3,00,000

D) 3,50,000

90. In execution of urban development project, PPP stands for

A) Purchasing Power Parity

B) Public Private Partnership

C) Providing Provisions Programme

D) Public Provisions Porgramme

91. The following projects are part of AMRUT 2.0

(i) Providing Universal Tapped Water supply

(ii) Providing Universal coverage of Sewerage and septage management

(iii) Metro Rail connection

(iv) Providing housing to urban poor

A) (i) and (iii)

B) (iii) and (iv)

C) (ii) and (iii)

D) (i) and (ii)

92. As per 7th schedule of the Constitution of India, land comes under the purview of:

A) Central Government

B) State Government

C) Municipal Corporation

D) Gram Panchayat

93. Radiant City concept was given by:

A) Le Corbusier

B) F.L. Wright

C) Doxiadis

D) Christopher Alexendar

94. Shyama Prasad Mukherji Rurban Mission is attempted for socio- economic and physical improvement of:

A) Urban Areas in hills

B) Rural Areas

C) Municipal Town

D) Core City Area

95. Which of the following is *NOT* a part of criteria for a place to qualify as Urban as per Census 2011

(i) 75% male workforce engaged in non-agriculture activities

(ii) A minimum population of 5000

(iii) A density of population of at least 800 persons per sq. km.

(iv) 70% of the buildings shall be pucca construction

A) (i) and (ii)

B) (iii) and (iv)

C) (ii) and (iii)

D) (i) and (iii)

96. *The Life and Death of Great American Cities* was written by

A) Jane Jacobs

B) Kevin Lynch

C) Homer Hoyyt

D) Christopher Alexendar

97. Sendai framework is instrumental for:

A) Sustainable Architecture

B) Ecosystem Preservation

C) Disaster Risk Reduction

D) Climate Change Mitigation

98. The criteria to qualify as a biodiversity hotspot, and area should have at least 1500 species of vascular plants found nowhere else in Earth, and it should have lost _____ % of its primary native vegetation.

A) 50%

B) 40%

C) 60%

D) 70%

99. As per evaluation system of GRIHA, points required for 3 star rating is:

A) 41-50

B) 81-90

C) 61-70

D) 71-80

100. An ecosystem (or ecological system) is a functional unit comprising all _____ in a particular place interacting with one another and with their physical environment and interconnected by an ongoing flow of _____ and a cycling of materials

A) Animals & Energy

B) Plants & Water

C) Organism & Energy

D) Vegetation & Water cycle

101. The value of Air Quality Index categorized as *POOR* is

A) 101-200

B) 201-300

C) 301-400

D) 401- 500

102. Which of the following is *NOT* a designated Biosphere reserve as per *Ministry of Environment, Forest and Climate Change*

A) Pachmarhi

B) Great Nicobar

C) Nilgiris

D) Gangetic Planes

103. To slow down the speed of surface water from reaching the retention area or storm water pond, the following can be utilized

A) Paved drain

B) Bioswale

C) Concrete Drain

D) PVC Pipe

104. Artificial hills, ponds, islands, south garden, garden stream, waterfall, trees and shrubs are basic element of garden composition of

A) Mughal Gardens

B) Japanese Garden

C) British Garden

D) Persian Garden

105. Which of the following is *NOT* a contributor to Urban Heat island effects?

A) Concrete surface

B) Asphalt Surface

C) Heating and cooling plant

D) Soil surface

106. Which of the following tree has fastigiated or columnar habit?

A) Polyathia logifolia

B) Terminalia arjuna

C) Dalbergia sissoo

D) Delonix regia

107. Which of the following can be used as an environment friendly parking surface cover to achieve maximum permeable surface?

A) Paver block

B) Concrete

C) Turf Pave

D) Asphalt

108. Which of the followings is/are *NOT* among the 17 Sustainable Development Goal identified by the United Nations?

A) Affordable and Clean Energy

B) Life on Land

C) Green Buildings

D) Responsible Consumption and Production

109. What is the meaning of word 'Arch' and 'Tecton' in the word 'Architecture'?

A) Chief and Designer

B) Chief and Visualizer

C) Chief and Contractor

D) Chief and Carpenter

110. Give appropriate term to 'The reasonable remuneration in proportion to the benefits received by the defending party.'

A) Quantum Remunerate

B) Amount Fee

C) Quantum Meruit

D) Amount Cost

111. Who 'Assit in preparation & approval of the brief after understanding the intent of the promoters including cost targets as also for fixing of prizes & honorarium.

A) Assessors

B) CoA Judge

C) Designer

D) Council Member

112. Choose the correct name of the competition for 'It is intended for small projects of charitable organizations in which four to six local firms will compete for the appointment as Architects.'

A) Special Category Competition

B) Regional Special Category Competition

C) Open Competition

D) Limited Completion

113. 'Defects those which should have been identified before the issue of the final certificate.

A) Latent Defects

B) Patent Defects

C) Liability Defects

D) None of the Above

114. From the contractor's point of view, cost of equipment, legal expenses, tender fees etc. comes under:

A) Indirect Cost

B) Incidental Cost

C) Surprise Cost

D) None of the above

115. How will you estimate the following Lift Machine room, Electric sub-station etc?

A) Item wise Estimate

B) Area Basis Estimate

C) Cubic Contents wise

D) Building cost Index

116. Complete labour work of a building varies from:

A) 15% to 30%

B) 20% to 35%

C) 15% to 35%

D) 20% to 30%

117. An initial deposit which is sent along with the tender in order to show the genuineness of the contractor.

A) Security deposit

B) Retention amount

C) Mobilization fund

D) Earnest Money

118. Select the correct year in 'The Arbitration & Conciliation Act_____

A) 1996

B) 1992

C) 1994

D) 1998

119. Method to settle dispute & differences:

A) RADM

B) MRDA

C) DRMA

D) ADRM

120. 'Live and let others live' defines what:

A) Land Acquisition

B) Standard corporation

C) Easement

D) None of the above

ROUGH WORK

ROUGH WORK

ROUGH WORK

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

Booklet Serial No. 209681

Test Booklet Series

TEST BOOKLET
ASSISTANT PROFESSOR COMPUTER ENGINEERING / COMPUTER SCIENCE AND ENGINEERING

A

Written Test - 2023
(07, 08)

Time Allowed: Two Hours ***Maximum Marks: 120***

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.**
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT*** **write** ***anything else*** on the Test Booklet.
4. This Test booklet contains **120** items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
5. You have to mark all your responses ***ONLY*** on the separate Answer /Response Sheet provided. *See directions in the Response Sheet.*
6. *All* items carry equal marks.
7. Before you proceed to mark in the Answer /Response Sheet, the response to various items in the Test Booklet, you have to fill in some particulars in the Answer /Response Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer /Response Sheet.*** You are permitted to take away with you the Test Booklet and ***Candidate's Copy of the Response Sheet .***
9. Sheets for rough work are appended in the Test Booklet at the end.
10. While writing Centre, Subject and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN".**
11. **Penalty for wrong answers:**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).

    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **(0.25)** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

1. What does the following fragment of C-program print?

```
#include <stdio.h>
int main() {
    char c[ ] = "YEAR2023";
    char *p = c;
    printf("%.*s", p[3] - p[1], p + 1);
return 0;
}
```

A) YEAR2023
B) 023
C) EAR2023
D) None of the mentioned

2. Consider the following C-program :

```
#include <stdio.h>
int fun()
{
static int num = 10;
return num—;
}
int main()
{
for (fun(); fun(); fun())
printf("%d ", fun());
return 0;
}
```

What is output of above program?

A) Infinite loop
B) 7 4 1
C) 8 5 2
D) None of the mentioned

3. What is the best description of polymorphism?

A) It is the ability for a message/data to be processed in more than one form.
B) It is the ability for a message/data to be processed in only one form.
C) It is the ability for many messages/data to be processed in one way.
D) It is the ability for undefined message/data to be processed in at least one way.

4. What term is used to describe languages that support classes but not polymorphism?

A) Class-based language
B) Procedure-Oriented language
C) Object-based language
D) Polymorphism is always supported if classes are used

5. Which aspect of Object-Oriented Programming (OOP) is associated with code reusability?

A) Abstraction

B) Polymorphism

C) Encapsulation

D) Inheritance

6. What feature of Object-Oriented Programming (OOP) is demonstrated by the following code snippet?

```
class employee {
public:
    int salary;
};
class manager : public employee {
public:
    int age;
    manager(int age) {
      this->age = age;
    }
};
```

A) Encapsulation and Inheritance

B) Inheritance and polymorphism

C) Polymorphism

D) Inheritance

7. Which feature enables one object to interact with another object in an object-oriented programming paradigm?

A) Message reading

B) Message Passing

C) Data transfer

D) Data Binding

8. In a pure Object-Oriented Programming (OOP) language, which of the following statements is true?

A) The language should implement at least 1 feature of OOP.

B) The language must implement only 3 features of OOP.

C) The language must implement all the rules of OOP.

D) The language should implement 3 or more features of OOP.

9. In Object-Oriented Programming (OOP) using C++, how many types of access specifiers are provided?

A) Four
B) Three
C) Two
D) One

10. Which constructor will be called from the object created in the below C++ code?

```
#include <iostream>
using namespace std;
class C
{
    int i;
public:
    C( )
    {
      i = O;
      cout << i;
    }
C(int x = 0)
{
    i = x;
    cout << i;
  }
};
int main()
{
    C object l;
    return 0;
}
```

A) Only parameterized constructor
B) Only default constructor
C) Program will give a run time error
D) Program will give a compile time error

11. In object-oriented programming, what does abstraction refer to?

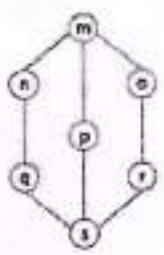
A) Hiding the code implementation and showing only the features for implementation
B) Hiding the important data from code
C) Hiding the code implementation
D) Showing the important data only

12. Which among the following is correct for the class defined below?

```
class student
{
    int marks;
public:
    student( ) {}
    student(int x)
    {
      marks = x;
    }
};
int main( )
{
student a1 (500);
student a2( );
student a3 = 600;
return 0;
```

A) Program will give compile time error
B) There are syntax errors for object a3.
C) Both object al and a2 will be created, but not a3.
D) The program will run successfully, and all objects are created.

13. Consider the following lattice:



How many elements have their complement as "q"?

A) One
B) Two
C) Three
D) Four

14. In graph theory, a cycle is a path that starts and ends at the same vertex. Which of the following statements about cycles in an undirected graph is true?

A) Every vertex in the cycle has exactly two neighbours.
B) A cycle can have any number of vertices.
C) Cycles are only present in connected graphs.
D) A cycle is also known as a tree.

15. The degree of a vertex in an undirected graph is defined as:
    A) The number of edges incident to the vertex.
    B) The number of vertices in the graph.
    C) The number of cycles passing through the vertex.
    D) The weight of the vertex.

16. What is the minimum number of colours required to colour the vertices of any graph such that no two adjacent vertices have the same colour?
    A) 1
    B) 2
    C) 3
    D) It depends on the size of the graph.

17. In a directed graph, a path is defined as:
    A) A sequence of edges between two vertices that visits every vertex exactly once.
    B) A sequence of vertices that visits every edge exactly once.
    C) A cycle that starts and ends at the same vertex.
    D) A cycle that starts and ends at different vertices.

18. The degree sequence of a graph is:
    A) The list of degrees of all vertices in non-increasing order.
    B) The list of degrees of all vertices in non-decreasing order.
    C) The sum of all degrees of vertices in the graph.
    D) The number of edges in the graph.

19. What is the Euler's formula for planar graphs?
    A) $V + E = F + 2$
    B) $V - E + F = 2$
    C) $V - E + F = 0$
    D) $V + E = F$

20. In a weighted graph, the shortest path between two vertices is found using:
    A) Depth-First Search (DFS)
    B) Breadth-First Search (BFS)
    C) Dijkstra's algorithm
    D) Kruskal's algorithm

21. The chromatic number of a graph is:

A) The number of edges in the graph.

B) The minimum degree of any vertex in the graph.

C) The maximum degree of any vertex in the graph.

D) The minimum number of colours required to colour the vertices of the graph.

22. A graph is called connected if:

A) It has no cycles.

B) Every vertex has the same degree.

C) There is a path between every pair of vertices.

D) The graph is planar.

23. What is the name of a graph that contains no cycles and is connected?

A) Tree

B) Cycle graph

C) Bipartite graph

D) Complete graph

24. Let A, B, and C be sets such that:

$A = \{x \mid x \text{ is a positive integer less than } 10\}$

$B = \{x \mid x \text{ is a prime number between 1 and } 10\}$

$C = \{2, 3, 5, 7\}$

Which of the following statements is true?

A) A is a subset of B

B) B is a proper subset of A

C) C is a subset of A

D) A and C are disjoint sets

25. Which of the following circuits can store one bit of data and can be used for various operations like addition and subtraction?

A) Flip-flop

B) Counter

C) Register

D) Adder

26. Which addressing modes among the following are appropriate for program relocation at run time?

A) Absolute addressing and Indirect addressing

B) Absolute addressing and Based addressing

C) Based addressing and Relative addressing

D) Absolute addressing, Based addressing, and Indirect addressing

27. Consider a program loaded into a byte-addressable memory with a size of 32 bits. The program starts at memory location 1000 (decimal). If the CPU is halted after executing the HALT instruction and an interrupt occurs, the return address (in decimal) saved in the stack will be:

A) 1007

B) 1020

C) 1028

D) None of the mentioned

28. In a JK flip-flop, when J = K = 1, the flip-flop behaves as a:

A) Toggle flip-flop

B) D flip-flop

C) SR flip-flop

D) T flip-flop

29. A hard disk has a transfer rate of 10 M bytes/second and is constantly transferring data to memory using DMA. The processor runs at 600 MHz and takes 300 and 900 clock cycles to initiate and complete a DMA transfer, respectively. If the size of the transfer is 20 Kbytes, what percentage of processor time is consumed for the transfer operation?

A) 5.0%

B) 1.0%

C) 0.5%

D) 0.1%

30. In a 4-stage pipeline, the stage delays are 150, 120, 160, and 140 nanoseconds, respectively. The registers used between the stages have a delay of 5 nanoseconds each. Assuming a constant clocking rate, the total time taken to process 1000 data items in this pipeline will be:

A) 120.4 microseconds

B) 160.5 microseconds

C) 165.5 microseconds

D) 590.0 microseconds

31. What is the purpose of swap space in the disk?

A) To save temporary HTML pages

B) To save process data

C) To store the super-block

D) To store device drivers

32. Which of the following flip-flops has its outputs connected back to its inputs to form a feedback loop?

A) D flip-flop

B) T flip-flop

C) JK flip-flop

D) SR flip-flop

33. A CPU has 24-bit instructions, and a program starts at address 300 (in decimal). The program counter (PC) stores the memory address of the next instruction to be fetched and executed. Which of the following is a legal program counter (all values in decimal)?

A) 400

B) 500

C) 600

D) 700

34. Which of the following is an example of a synchronous counter?

A) Ripple counter

B) Johnson counter

C) Up-down counter

D) Ring counter

35. How many 32K x 1RAM chips are required to provide a memory capacity of 256 K bytes?

A) 8

B) 32

C) 64

D) 12

36. A CPU operates with a five-stages pipeline and a frequency of 1GHz. The instruction fetch occurs in the first stage of the pipeline. In the third stage, a conditional branch instruction calculates the target address and evaluates the condition. When a conditional branch instruction is encountered, the processor stops fetching new instructions until the outcome of the branch is known. The program contains 10^9 instructions, out of which 20% are conditional branches. Assuming each instruction takes one cycle to complete on average, what is the total execution time of the program?

A) 1.0 second
B) 1.2 seconds
C) 1.4 seconds
D) 11.6 seconds

37. A data structure is required for storing a set of integers such that each of the following operations can be done is (logn) time, where n is the number of elements in the set.

1. Deletion of the smallest element.
2. Insertion of an element if it is not already present in the set.

Which of the following data structures can be used for this purpose ?

A) A heap can be used, but not a balanced binary search tree.
B) A balanced binary search tree can be used, but not a heap.
C) Both a balanced binary search tree and a heap can be used.
D) Neither a balanced binary search tree nor a heap can be used.

38. The concatenation of two lists is to be performed in O (1) time. Which of the following implementations of a list should be used?

A) Singly linked list
B) Doubly linked list
C) Circular doubly linked list
D) Array implementation of lists

39. Let f(n) = n2Logn and g(n) = n (logn) 10 be two positive functions of n. Which of the following statements is correct?

A) f(n) = O(g(n)) and g(n) != O(f(n))
B) f(n) != O(g(n)) and g(n) = O(f(n))
C) f(n) = O(g(n)) but g(n) = O(f(n))
D) f(n) != O(g(n)) but g(n) != O(f(n))

40. An array of n numbers is given, where n is an even number. The maximum as well as the minimum of these n numbers needs to be determined.

Which of the following is TRUE about the number of comparisons needed?

A) At least 2n - c comparisons, for some constant c, are needed.
B) At most 1.5n - 2 comparisons are needed.
C) At least nLog2n comparisons are needed.
D) None of the mentioned.

41. Consider the following two statements:

(i) A hash function (these are often used for computing digital signatures) is an injective function.

(ii) Encryption technique such as DES performs a permutation on the elements of its input alphabet.

Which one of the following options is valid for the above two statements?

A) Both are false

B) Statement (i) is true and statement (ii) is false

C) Statement (ii) is true and statement (i) is false

D) Both are true

42. Given the following input (4322, 1334, 1471, 9679, 1989, 6171, 6173, 4199) and the hash function x mod 10, which of the following statements are true?

(i) 9679, 1989, 4199 hash to the same value

(ii) 1471,6171 has to the same value

(iii) All elements hash to the same value

(iv) Each element hashes to a different value

A) i only

B) ii only

C) i and ii only

D) iii or iv

43. What is the height of the binary tree given its postorder traversal (8, 9, 6, 7, 4, 5, 2, 3, 1) and inorder traversal (8, 6, 9, 4, 7, 2, 5, 1, 3)?

A) 5

B) 1

C) 4

D) 10

44. Determine the height of a binary search tree that results from inserting the following numbers in the given order: 10, 1,3, 5, 15, 12, 16.

A) 5

B) 4

C) 3

D) 2

45. Among the given sorting algorithms, which one has the lowest worst-case complexity?

A) Bubble Sort

B) Quick Sort

C) Selection Sort

D) Merge Sort

46. Consider an array with n numbers, and the objective is to rearrange the elements so that all negative values appear before all positive ones. Determine the minimum number of exchanges required in the worst case.

A) N

B) n-1

C) n+1

D) None of the mentioned options

47. A sorting technique is considered stable when:

A) It has a time complexity of O(n log n).

B) It preserves the relative order of occurrence for non-distinct elements.

C) It employs the divide and conquer paradigm.

D) It consumes O(n) space.

48. In the implementation of a queue using an array to ensure efficient ENQUEUE and DEQUEUE operations, which statement below is correct?

(Here, 'n' represents the number of items in the queue.)

A) Both operations can be performed in O(1) time.

B) At most, one operation can be performed in O(1) time, but the worst- case time for the other operation will be $\Omega(n)$.

C) The worst-case time complexity for both operations will be $\Omega(n)$.

D) The worst-case time complexity for both operations will be $\Omega(\log n)$.

49. In a computer system, the page fault service time is measured to be 10ms, and the average memory access time is 20ns. If there is one page fault for every 10^6 memory accesses, what is the effective access time for the memory (round to the nearest integer)?

A) 21ns

B) 23ns

C) 30ns

D) 35ns

50. Among the following scheduling algorithms, which one is non-preemptive?

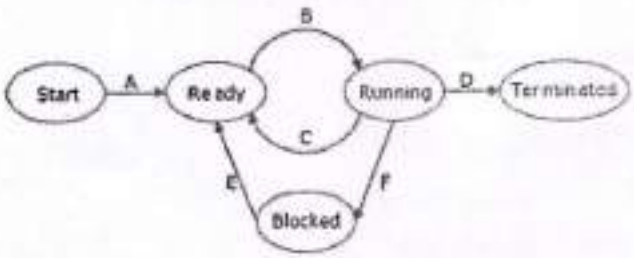
A) Round Robin

B) Multilevel Queue Scheduling

C) Multilevel Queue Scheduling with Feedback

D) First-In First-Out

51. Consider the process state transition diagram for a uniprocessor system provided below. Assume that there are always some processes in the ready state. Now, evaluate, the following statements:



I. If a process makes a transition D, it would result in another process making transition A immediately.

II. A process P2 in the blocked state can make transition E while another process Pl is in the running state.

III. The OS uses preemptive scheduling.

IV. The OS uses non-preemptive scheduling.

Identify which of the above statements are TRUE.

A) I and II

B) I and III

C) II and IV

D) II and III

52. A multilevel page table is favored over a single level page table for translating virtual addresses to physical addresses because:

A) It reduces the memory access time required to read or write a memory location.

B) It helps to decrease the size of the page table needed to implement the virtual address space of a process.

C) It is utilized by the translation lookaside buffer.

D) It helps to lower the number of page faults in page replacement algorithms .

53. Consider a process executing the code:

```
fork();
fork();
fork();
```

Determine the total number of child processes created.

A) 3

B) 4

C) 7

D) 8

54. In a computer system with 36-bit physical addresses and 32-bit virtual addresses, utilizing a page frame size of 4 Kbytes and 4-byte page table entries, a three-level page table is employed for virtual-to-physical address translation. The bits of the virtual address are allocated as follows for indexing into each level of the page table:

- Bits 30-31 index the first level page table.
- Bits 21-29 index the second level page table.
- Bits 12-20 index the third level page table.
- Bits 0-11are used as the offset within the page.

Determine the number of bits needed to address the next level page table (or page frame) in the page table entry of the first, second, and third level page tables, respectively.

A) 20, 20, and 20

B) 24, 24, and 24

C) 25, 25, and 24

D) 24, 24, and 20

55. Consider a CPU that generates 32-bit virtual addresses, and the page size is 4 KB. The processor is equipped with a translation look-aside buffer (TLB) that has a total of 128 page table entries and is 4-way set associative. Determine the minimum size of the TLB tag.

A) 11bits

B) 13 bits

C) 15 bits

D) 20 bits

56. Which of the following sets of conditions is necessary for a deadlock to occur in a system?

A) Mutual Exclusion, Hold and Wait, No Preemption, Circular Wait

B) Exclusive Access, No Waiting, Preemption, No Deadlock

C) Resource Allocation, Request and Release, Circular Wait, No Waiting

D) Allocation Order,No Preemption, Circular Wait, No Deadlock

57. Which of the following deadlock handling techniques is not a practical solution?

A) Deadlock Avoidance

B) Deadlock Ignorance

C) Deadlock Prevention

D) None of the mentioned

58. By implementing which of the following techniques can the circular waiting condition in deadlock be avoided?

A) Resource Allocation Graph

B) Banker's Algorithm

C) Timeouts

D) None of the mentioned

59. Which deadlock prevention technique requires the system to know in advance how many resources a process will need during its execution?

A) Banker's Algorithm

B) Preemptive Scheduling

C) Resource Allocation Graph

D) None of the mentioned

60. Which of the following is a necessary condition for deadlock?

A) Mutual Exclusion

B) Hold and Wait

C) No Preemption

D) Circular Wait

61. In the context of parsing, LL(l) means that:

A) The parser uses one lookahead token to predict the production rule to apply.

B) The parser can handle left-recursive productions with a lookahead of 1.

C) He parser is left-to-right and scans the input once to create a parse tree.

D) The parser can handle ambiguous grammars without conflicts.

62. LR(1) is a more powerful parsing technique than LL(1) because:

A) It can handle left-recursive productions more efficiently.

B) It can handle grammars with more lookahead tokens.

C) It can handle a larger class of context-free grammars without left- recursion.

D) It generates smaller parsing tables compared to LL(l).

63. LALR(l) stands for:

A) Left-Associative Left-to-right Parsing with 1lookahead token

B) Lookahead Assisted Left-to-right Parsing with 1token

C) Lookahead Assisted Left-to-right Recursive Parsing with 1 lookahead token

D) Lookahead Assisted LR Parsing with 1lookahead token

64. In LALR(l) parsing, conflicts may arise when two or more items have the same lookahead symbol. This conflict is resolved using:

A) Shift-reduce conflict resolution

B) Reduce-reduce conflict resolution

C) Lookahead conflict resolution

D) Grammar conflict resolution

65. Consider the following grammar :

$S \rightarrow CC$

$C \rightarrow cC|d$

A) LL(l)

B) SLR(l) but not LL(l)

C) LALR(l) but not SLR(l)

D) LR(l) but not LALR(l)

66. Consider the given context-free grammar:

$E \rightarrow E + E$

$E \rightarrow (E * E)$

$E \rightarrow id$

where E is the starting symbol,and the set of terminals includes id, (, +,), and *. The set of nonterminals consists of only E.

Which of the following terminal strings would result in more than one parse tree when parsed using the above grammar?

A) id + id + id + id

B) id + (id * (id * id))

C) (id * (id * id)) + id

D) ((id * id + id) * id)

67. The given grammar is:

$S \rightarrow aSa|bS|c$

A) LL(l) but not LR(l)

B) LR(l) but not LL(l)

C) Both LL(l) and LR(l)

D) Neither LR(l) nor LL(l)

68. Which of the following options correctly identifies the handles in the right-sentential form of the reduction for the sentence "n + n x n" using the given grammar?

$E \rightarrow E + n/E \times n/n$

A) n, E + n, and E + n × n

B) n, E + n, and E + E × n

C) n, n + n, and n + n × n

D) n, E + n, and E × n

69. Consider the grammar rule:

E → E1 - E2

for arithmetic expressions. The generated code targets a CPU with a single user register.The subtraction operation requires the first operand to be in the register. If El and E2 do not have any common subexpression, which order of evaluation should be chosen to get the shortest possible code?

Please select the option that indicates the most efficient order of evaluation to minimize code length when there are no common subexpressions between El and E2.

A) E2 should be evaluated first.

B) El should be evaluated first.

C) The order of evaluation of El and E2 is of no consequence.

D) Evaluation of El and E2 should necessarily be interleaved.

70. Which of the following tasks is NOT part of the compilation process?

A) Dynamic memory allocation
B) Type checking
C) Symbol table management
D) Inline expansion

71. For the given basic block:

a = b + c
c = a + d
d = b + c
e = d - b
a = e + b

Find the minimum number of nodes and edges present in the Directed Acyclic Graph (DAG) representation of the above basic block, respectively.

Please select the option that correctly identifies the number of nodes and edges in the DAG representation of the basic block.

A) 6 nodes and 6 edges
B) 8 nodes and 10 edges
C) 9 nodes and 12 edges
D) 4 nodes and 4 edges

72. Which of the following is NOT a typical peephole optimization?

A) Constant folding
B) Dead code elimination
C) Common subexpression elimination
D) Loop unrolling

73. Consider the SQL query:

vbnet
Copy code

```
SELECT title
FROM book AS B
WHERE (SELECT COUNT(*)
    FROM book AS T
    WHERE T.price > B.price) < 5
```

What does the above SQL query retrieve from the "book" relation?

A) Titles of the four most expensive books
B) Title of the fifth least expensive book
C) Title of the fifth most expensive book
D) Titles of the five most expensive books

74. Consider the table T1 in a relational database with the following rows and columns:

roll no.	marks
1	5
2	10
3	15
4	Null

The following sequence of SQL statements was successfully executed on table T1:

UPDATE T1 SET marks = marks + 10

SELECT AVG(marks) FROM T1

What is the output of the SELECT statement?

A) 16.75

B) 20

C) 25

D) Null

75. Consider the following relation:

Cinema (theatre, address, capacity)

Which of the following options should be used at the end of the SQL query to always find the addresses of theaters with the maximum capacity?

SELECT P1.address

FROM Cinema P1

A) WHERE P1.Capacity >= ALL (SELECT P2.Capacity FROM Cinema P2)

B) WHERE P1.Capacity >= ANY (SELECT P2.Capacity FROM Cinema P2)

C) WHERE P1.Capacity > ALL (SELECT MAX(P2.Capacity) FROM Cinema P2)

D) WHERE P1.Capacity > ANY (SELECT MAX(P2.Capacity) FROM Cinema P2)

76. Which of the following statements about an SQL query are TRUE?

P: An SQL query can contain a HAVING clause even if it does not have a GROUP BY clause.

Q: An SQL query can contain a HAVING clause only if it has a GROUP BY clause.

R: All attributes used in the GROUP BY clause must appear in the SELECT clause.

S: Not all attributes used in the GROUP BY clause need to appear in the SELECT clause.

A) P and R

B) P and S

C) Q and R

D) Q and S

77. Ankit digitally signs a message and sends it to Seema. Verification of the signature by Seema requires.

A) Ankit's public key.
B) Seema's public key.
C) Seema's private key.
D) Ankit's private key.

78. Consider the relation scheme R = {E, F,G, H, I, J, K, L, M, N} and the set of functional dependencies:

{E, F} -> {G}
{F} -> {I, J}
{E, H} -> {K, L}
K -> {M}
L -> {N}

What is the key for relation R?

A) {E}
B) {E, F}
C) {E, F, H}
D) {E, F, H, K, L}

79. Consider the following functional dependencies:

F: Set of functional dependencies
R: Relation with attributes A, B, C, D, and E
F: $A \rightarrow BC$; $CD \rightarrow E$; $B \rightarrow D$; $E \rightarrow A$
What are the candidate keys for relation R?

A) A, B
B) A, B, C
C) A, E, CD
D) A, B, D

80. Consider the following relation instance:

x	y	z
1	4	2
1	5	3
1	6	3
3	2	2

Which of the following functional dependencies are satisfied by the given instance?

A) $XY \rightarrow Z$ and $Z \rightarrow Y$
B) $YZ \rightarrow X$ and $Y \rightarrow Z$
C) $YZ \rightarrow X$ and $X \rightarrow Z$
D) $XZ \rightarrow Y$ and $Y \rightarrow X$

81. In an ER diagram, a double-lined attribute represents:

A) Primary Key

B) Foreign Key

C) Multivalued attribute

D) Derived attribute.

82. In an ER diagram, a dashed line connecting two entities represents:

A) One-to-One relationship

B) One-to-Many relationship

C) Many-to-One relationship

D) Many-to-Many relationship

83. Which recovery technique is based on saving the state of the database at regular intervals and storing only the changes made since the last savepoint?

A) Checkpointing

B) Incremental backup

C) Replication

D) Write-ahead logging

84. Which recovery technique involves backing up the entire database regularly to protect against catastrophic failures?

A) Checkpointing

B) Shadow paging

C) Full database dump

D) Incremental backup

85. What is the initial stage of the software development lifecycle?

A) System Design

B) Coding

C) System Testing

D) Preliminary Investigation and Analysis

86. What is the term used to refer to the examination and analysis of an existing system?

A) Details of DFD

B) Feasibility Study

C) System Analysis

D) System Planning

87. What is the full form of RAD?

A) Rapid Application Document

B) Rapid Application Development

C) Relative Application Development

D) None of the mentioned

88. Which of the following prototypes is not associated with the Prototyping Model?

A) Domain Prototype

B) Vertical Prototype

C) Horizontal Prototype

D) Diagonal Prototype

89. What is the main disadvantage of the RAD (Rapid Application Development) model?

A) It requires highly skilled developers/designers.

B) It necessitates customer feedback.

C) It increases component reusability.

D) Both A & C

90. Which of the following models is not related to the Evolutionary Process Model?

A) Incremental Model

B) Concurrent Development Model

C) WINWIN Spiral Model

D) All of the above

91. The selection of a model is based on which of the following factors?

A) Requirements

B) Development team & users

C) Project type & associated risk

D) All of the above

92. Which of the following model combinations does not require defining requirements at the earliest stage in the lifecycle?

A) RAD & Waterfall

B) Prototyping & Waterfall

C) Spiral & Prototyping

D) Spiral & RAD

93. Which of the following model combinations may not result in the desired output when user participation is not involved?

A) Prototyping & Waterfall

B) Prototyping & RAD

C) Prototyping & Spiral

D) RAD & Spiral

94. Which of the following is an example of Black Box and Functional Processing?

A) First Generation Language

B) Second Generation Language

C) Third Generation Language

D) Fourth Generation Language

95. The design pattern that allows objects to communicate without knowing each other's class and encapsulates the interaction between objects is called:

A) Observer

B) Mediator

C) Adapter

D) Proxy

96. The architectural design of a software system includes:

A) Detailed algorithms and data structures

B) Low-level implementation details

C) High-level structure and organization of the system

D) Performance optimization techniques

97. Cloud computing is a form of abstraction that combines physical resources and presents them as _____ resources to users.

A) Real

B) Cloud

C) Virtual

D) None of the mentioned

98. Which one of the following cloud concepts is related to the sharing and pooling of resources?

A) Polymorphism

B) Virtualization

C) Abstraction

D) None of the mentioned

99. Which of the following is a fundamental concept related to Cloud?

A) Reliability

B) Abstraction

C) Productivity

D) None of the mentioned

100. Which one of the following is a phase of the Deployment process in Cloud Computing?

A) Selecting Cloud Computing Provider

B) IT Architecture Development

C) Business Architecture Development

D) Transformation Plan Development

101. Which model involves the special types of services that users can access on a Cloud Computing platform?

A) Service

B) Planning

C) Deployment

D) Application

102. In a communication link with a transmission speed of 10^6 bits/sec. It uses data packets of size 1000 bytes 'each. Assume that the acknowledgement has negligible transmission delay, and that its propagation delay is the same as the data propagation delay. Also assume that the processing delays at the nodes are negligible. The efficiency of the stop-and-wait protocol in this setup is exactly 25%. The value of the one-way propagation delay (in milliseconds) is _____.

A) 10

B) 12

C) 15

D) 20

103. Assuming you have requested a web page through your web browser to a web server,and the browser cache is empty. The browser is configured to send HTTP requests in non-persistent mode. The web page contains text and five very small images. What is the minimum number of TCP connections required to display the web page completely in your browser?

A) 0

B) 1

C) 10

D) 6

104. When a browser requests a web page from a remote server, assuming that the host has just been restarted, identify the correct sequence in which the following packets are transmitted on the network by a host:

A) HTTP GET request, DNS query, TCP SYN

B) DNS query, HTTP GET request, TCP SYN

C) DNS query,TCP SYN, HTTP GET request

D) TCP SYN, DNS query, HTTP GET request

105. Which of the following protocols is NOT employed to map one form of address to another one?

A) DNS

B) ARP

C) DHCP

D) RARP

106. Which of the following statements is TRUE in an Ethernet local area network?

A) Once a station starts transmitting a frame, it stops sensing the channel.

B) The jamming signal is used to pad the frames that are smaller than the minimum frame size.

C) A station continues to transmit the packet even after detecting a collision.

D) The exponential backoff mechanism reduces the probability of collision on retransmissions.

107. Which of the following pairs of OSI protocol layer/sub-layer and its functionality is INCORRECT?

A) Network layer and Routing

B) Transport layer and End-to-end process communication

C) Data Link Layer and Bit synchronization

D) Medium Access Control sub-layer and Channel sharing

108. The value of 3^{51} mod 5 is _____.

A) 0

B) 1

C) 2

D) 3

109. How many output layers does an Artificial Neural Network need?

A) 1

B) 2

C) 3

D) 4

110. In which type of model does the algorithm learn from a labeled dataset and evaluate its accuracy using answer keys?

A) Supervised learning

B) Unsupervised learning

C) Reinforcement learning

D) Semi-unsupervised learning

111. Which activation function is suitable for output layers in regression tasks where the target values are continuous?

A) Softmax

B) ReLU (Rectified Linear Unit)

C) Tanh (Hyperbolic tangent)

D) Linear activation function

112. Which activation function is useful for handling the vanishing gradient problem and allows small negative values for inputs less than 0?

A) Sigmoid

B) ReLU (Rectified Linear Unit)

C) Tanh (Hyperbolic tangent)

D) Leaky ReLU

113. Which activation function is defined as $f(x) = \max(0, x)$?

A) Sigmoid

B) Leaky ReLU

C) Softmax

D) ReLU (Rectified Linear Unit)

114. In a fuzzy set, the membership function represents:

A) The probability of an element belonging to the set

B) The degree of membership of an element in the set

C) The cardinality of the set

D) None of the mentioned

115. The truth value of fuzzy set is/are

A) Between 0 and 1both exclusive

B) Either 0 or 1

C) 0.5

D) Between 0 and 1both inclusive

116. Which of the following is a primary characteristic of unsupervised learning?

A) It requires labeled data for training.

B) It involves learning from a reward-based system.

C) It aims to find patterns and relationships in data without explicit target labels.

D) It is mainly used for classification tasks.

117. Which algorithm is commonly used in unsupervised learning to group similar data points together based on their inherent characteristics?

A) Decision Tree

B) k-Nearest Neighbors (k-NN)

C) K-means Clustering

D) Support Vector Machine (SVM)

118. In reinforcement learning, what does an agent aim to maximize or minimize?

A) The number of training iterations

B) The amount of labeled data

C) The cumulative reward received from the environment

D) The size of the neural network used

119. What is the role of the reward function in reinforcement learning?

A) To penalize the agent for taking actions

B) To provide guidance on the next action to take

C) To determine the number of training episodes

D) To provide feedback to the agent based on its actions

120. Which of the following problems cannot be solved?

A) Halting problem

B) Boolean Satisfiability problem

C) Halting problem and Boolean Satisfiability problem

D) None of the mentioned