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T.B.C. : PKL-G-KBX

Test Booklet Series

Serial No.

0135149

TEST BOOKLET
Paper I
(GENERAL STUDIES AND ENGINEERING APTITUDE)

A

Time Allowed : Two Hours

Maximum Marks : 200

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 CARE-FULLY AND WITHOUT ANY OMISSION OR DISCREPANCY AT THE APPROPRIATE . PLACES IN THE *OMR* ANSWER SHEET. ANY OMISSION/DISCREPANCY WILL RENDER THE ANSWER 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 **100** items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer 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 your responses **ONLY** on the separate Answer Sheet provided. See directions in the Answer Sheet.

6. All items carry equal marks.

7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.

8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.

9. Sheets for rough work are appended in the Test Booklet at the end.

10. **Penalty for wrong Answers :**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE.

    (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, **one-third** 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 **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to 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.

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1. Which of the following are the elements of TQM ?

1. Teamwork and Employee empowerment
2. Feedback mechanisms
3. Strong division of labour
4. Result oriented management

Select the correct answer using the code given below :

(a) 1 and 2 only
(b) 3 and 4 only
(c) 2, 3 and 4 only
(d) 1, 2, 3 and 4

2. The quality characteristics can be categorized in which of the following groupings ?

1. Sensory characteristics
2. Structural characteristics
3. Statistical characteristics
4. Time oriented characteristics

Select the correct answer using the code given below :

(a) 1, 2, 3 and 4
(b) 1 and 4 only
(c) 2 and 3 only
(d) 1, 2 and 4 only

3. What are the major categories for quality costs ?

1. Prevention costs
2. Appraisal costs
3. Production costs
4. Internal failure costs

Select the correct answer using the code given below :

(a) 1, 2 and 3 only
(b) 1, 2 and 4 only
(c) 3 and 4 only
(d) 1, 2, 3 and 4

4. Consider the following statements regarding evaluating sampling plans :

1. If rectifying inspection is conducted for lots rejected by the sampling plan is the average total inspection.

2. The average number of items inspected for a series of lots in order to make a decision is the average sample number.

3. The average quality level of a series of batches that leave the inspection station after coming in for inspection at a certain quality level is the average outgoing quality limit.

Which of the above statements are correct ?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

5. Consider the following statements with reference to principal quality objectives :

1. The organization should achieve and sustain the quantity of the product so as to continually meet the purchaser's stated or implied needs.

2. The organization should provide confidence to its own management that the intended quality is being achieved and sustained.

3. The organization should provide confidence to the purchaser that the intended quality is being, or will be, achieved in the delivered product.

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

6. Trial runs are recommended for which of the following reasons ?

1. Trial runs provide an opportunity to remedy the situation during the experiment.

2. Trial runs provide a final chance to fine-tune levels of a factor.

3. Trial runs provide a chance to make any needed changes in the experimental plan during the experiment.

4. Trial runs can help considerably in estimating the time to complete a run, the logistical support required for level changes, and total time needed to complete an experiment.

Select the correct answer using the code given below :

(a) 1, 2, 3 and 4

(b) 1 and 3 only

(c) 2 and 4 only

(d) 2, 3 and 4 only

7. Which one of the following is NOT a source of variation present in every process of construction ?

(a) The equipment

(b) The material

(c) The environment

(d) The specifications

8. The international dispute about modern environmental movement began with the publication of *Silent Spring* by

(a) Mary Daly

(b) Rachel Carson

(c) Carolyn Merchant

(d) Maria Mies

9. Which one of the following is NOT a principle of CERES ?

(a) Controlled production

(b) Energy conservation

(c) Informing the public

(d) Protection of the biosphere

10. The largest tidal range in the world is

(a) Bay of Fundy

(b) Ungava Bay

(c) Bristol Channel

(d) Turnagain Arm of Cook Inlet

11. Kyoto Protocol operationalizes the UN framework convention on

(a) sustainable development

(b) renewable energy

(c) climate change

(d) soil erosion

12. According to Carson, which one of the following approaches argues that nature has intrinsic value and we should protect it because of this value ?

(a) Instrumental approach

(b) Axiological approach

(c) Eco-critical approach

(d) Anthropological approach

13. The Gaia hypothesis, which suggested that the earth should be seen as a single organism, was devised by

(a) James Lovelock

(b) Francoise d' Eaubonne

(c) Earnest Haeckel

(d) Paul Ehrlich

14. Energy used by man does NOT originate from which one of the following sources ?

(a) Radiant energy

(b) Geothermal power

(c) Frictional energy

(d) Gravitational energy

15. The term "Sacred Cow" is often used to denote a project that

(a) a powerful, high-ranking official is advocating

(b) facts are advocating

(c) sound reasoning is advocating

(d) less weaknesses are advocating

16. Which one of the following is NOT a condition for preferring Top-Down Time and Cost Estimates ?

(a) Strategic decision making

(b) Cost and time important

(c) High uncertainty

(d) Internal, small project

17. In Network Computation Process, which one of the following is correct for forward pass ?

(a) It starts with the first project activity(ies) and traces each path (chain of sequential activities) through the network to the last project activity(ies)

(b) This is the longest path in the network, which will delay the project

(c) It starts with the last project activity(ies) on the network

(d) It starts with the last project activity(ies) and traces each path (chain of sequential activities) through the network to the first project activity(ies)

18. Consider the following statements regarding production :

The major aspects of production that may lead to sickness are

1. increase in the cost of production.

2. decrease in the quantity of production.

3. quality of product not meeting the standards/customer expectation.

4. Producing more quantity than can be sold, leading to accumulation of stock.

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 1, 2, 3 and 4

(c) 2 and 3 only

(d) 1, 3 and 4 only

19. Which one of the following projects are those which are to be completed within a stipulated time, even at the cost of ending up with a higher project cost ?

(a) Normal projects

(b) Business projects

(c) Crash projects

(d) Research projects

20. Which one of the following policies is concerned with changing the supply of money stock and the rate of interest, for the purpose of stabilizing the economy at full potential output level ?

(a) Commercial policy

(b) Fiscal policy

(c) Monetary policy

(d) Social policy

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21. Which one of the following is NOT a classification of microscopic diffusion ?

 (a) Inter-diffusion

 (b) Vacancy diffusion

 (c) Surface diffusion

 (d) Lattice diffusion

22. Many bulk polymers that are crystallized from a melt, are semi crystalline and form which one of the following structures ?

 (a) Spherolite structure

 (b) Spherelite structure

 (c) Spherulite structure

 (d) Spherilite structure

23. 'Positive and negative ions by virtue of their net electrical charge, attract one another', these attractive bonding forces are

 (a) Coulombic

 (b) Magnetic

 (c) Electromagnetic

 (d) Non-magnetic

24. The process by which plastic deformation is produced by dislocation motion is termed as

 (a) Plane slit

 (b) Seepage

 (c) Slip

 (d) Twinning

25. Stereoisomerism denotes the situation in which atoms are linked together

 (a) in the different order and also differ in their spatial arrangement

 (b) in the different order but same in their spatial arrangement

 (c) in the same order (head-to-tail) but differ in their spatial arrangement

 (d) in the same order (head-to-tail) and also same in their spatial arrangement

26. Some of the complex thermoplastic chains become so stiff that they act as rigid rods, even when heated above the melting point. These materials are

 (a) Solid crystalline polymers

 (b) Semi solid crystalline polymers

 (c) Liquid crystalline polymers

 (d) Copolymers

27. Which one of the following are the well-known routing attacks on IoT ?

 (a) Clone Id and Sybil attacks

 (b) Selective-reversing attacks

 (c) Packet reversing attacks

 (d) Frame selective wired attacks

28. Which one of the following layers in the OSI reference model is concerned with transmission of unstructured bit stream over physical medium; deals with the mechanical, electrical, functional, and procedural characteristics to access the physical medium ?

(a) Transport layer

(b) Network layer

(c) Data link layer

(d) Physical layer

29. Which one of the following systems is used when there are rigid time requirements on the operation of a processor or the flow of data, and thus is often used as a control device in a dedicated application ?

(a) A real-time system

(b) A distributed system

(c) A parallel system

(d) A serial system

30. Which one of the following servers is a tool that allows an information provider to prepare indexes of unstructured documents, and allows users to search these indexes with natural language questions ?

(a) Name server

(b) Terminal server

(c) Wide area information server

(d) File server

31. Which one of the following protocols is designed to provide privacy between two communicating applications viz a client and a server ?

(a) Data link layer protocol

(b) Physical layer protocol

(c) Secure socket layer protocol

(d) Session layer protocol

32. Which one of the following is an advantage of branched or Intrinsic programming type or style in ICT based teaching and learning process ?

(a) Large frames reduce the time of learning

(b) There is a possibility of guess-work

(c) It is very expensive to provide so many audio-visual aids

(d) Revise/redesign at frequent intervals is difficult and expensive

33. Which one of the following learnings is a teaching approach that engages students in sustained, collaborative real-world investigations ?

(a) Project-based learning

(b) Cooperative learning

(c) Collaborative learning

(d) Outcome based learning

34. Which one of the following schemes is used for radio stations within the same region, where each radio station has its own frequency ?

(a) Space division multiplexing

(b) Frequency division multiplexing

(c) Time division multiplexing

(d) Code division multiplexing

35. The AES key expansion algorithm takes as input a 4-word (16-byte) key and produces a linear array of

(a) 50 words (200 bytes)

(b) 44 words (176 bytes)

(c) 40 words (160 bytes)

(d) 35 words (140 bytes)

36. Consider the following statements regarding engineers as responsible experimenters :

1. It includes a conscientious commitment to live by moral values.

2. It can be accountable for the results of the project.

3. It restricts free-personal involvement in all steps of the project or product development.

4. It includes constant awareness of the progress of the experiment and readiness to monitor the side effects, if any.

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 3 and 4 only

(c) 1, 2 and 4 only

(d) 1, 2, 3 and 4

37. Which one of the following is NOT included in Nussbaum's basic human functional capabilities ?

(a) Being able to live a human life of normal length

(b) Being able to use senses, imagine, think, and reason

(c) Being able to laugh, play, and enjoy recreational activities

(d) Being able to earn livelihood and live peacefully

38. Which one of the following is NOT a type of virtue for responsible professionalism

(a) Public-spirited virtue

(b) Teamwork virtue

(c) Self-realization virtue

(d) Self-direction virtue

39. Which one of the following is NOT Davis' eight moral tests ?

(a) Harm test

(b) Acceptability test

(c) Virtue test

(d) Professional test

40. Arrange the following in hierarchical order as suggested by Carroll in the four-part model of corporate social responsibility ?

1. Economic

2. Philanthropic

3. Legal

4. Ethical

Select the correct answer using the code given below :

(a) 2, 4, 3, 1

(b) 4, 3, 1, 2

(c) 2, 1, 3, 4

(d) 1, 3, 4, 2

41. The Engineers for a Sustainable World (ESW) meant for using the professional talents to create a more sustainable world was founded in

(a) 1999

(b) 2000

(c) 2001

(d) 2002

42. Which one of the following is NOT covered under the International Labour Organization declaration on fundamental principles and rights at work (1998) ?

(a) Freedom of association and the right to collective bargaining

(b) The elimination of forced and compulsory labour

(c) The abolition of child labour

(d) The global compact on migration

43. Which one of the following does NOT come under business ethics ?

(a) Avoid breaking the law

(b) Avoid actions that are bad for one's image

(c) Avoid action

(d) Avoid conflict

44. Which one of the following principles refers to whom may be affected by the actions of the company that affect health, safety, or the environment and refrain from taking reprisals against employees who report dangerous incidents to management or appropriate authorities ?

(a) Safe product and service

(b) Informing the public

(c) Environmental restoration

(d) Risk reduction

45. The Defence Research and Development Organization (DRDO) has successfully test-fired medium-range subsonic cruise missile Nirbhay from the Integrated Test Range (ITR) at

(a) Chandipur, Odisha

(b) Cuddalore, Tamil Nadu

(c) Nellore, Andhra Pradesh

(d) Digha, West Bengal

46. Which one of the following is NOT correct regarding the Khel Ratna Award ?

(a) The award was inaugurated in 1991-92

(b) The award comprises a medallion, a certificate, and a cash prize of ₹15 lakh

(c) The first recipient of the Khel Ratna was chess legend, Viswanathan Anand

(d) The award renamed as Major Dhyan Chand Khel Ratna Award

47. How many Indian companies have found a place in 2021 Fortune's Global 500 list ?

(a) Three

(b) Five

(c) Seven

(d) Nine

48. Which one of the following is NOT important initiatives under EASE 4·0 ?

(a) Smart lending for aspiring India

(b) New age 24×7 banking with resilient technology

(c) Collaborative banking for synergistic outcomes

(d) Parameters of FI-Index

49. Which one of the following statements is NOT correct regarding the Pension Fund Regulatory and Development Authority (PFRDA) ?

(a) It has increased the entry age for the National Pension System (NPS) from 60 years to 65 years

(b) Earlier the eligible age to invest in NPS was 18-65 years which has now been revised to 18-70 years

(c) As per the revised norms, any Indian Citizen, resident or non-resident and Overseas Citizen of India (OCI) between the age of 65-70 years can join NPS

(d) Subscribers can continue or defer their NPS Account up to the age of 75 years

50. World's largest star sapphire cluster has been found in

(a) Rajkot, India

(b) Ratnapura, Srilanka

(c) Pretoria, South Africa

(d) Brisbane, Australia

51. Consider the following statements regarding Cybersecurity Multi-Donor Trust Fund :

1. The World Bank has launched a new 'Cybersecurity Multi-Donor Trust Fund', to better roll out cybersecurity development agenda in a systematic manner.

2. The new fund has been developed as an associated trust fund under the broader Digital Development Partnership (DDP) umbrella program.

3. World Bank has partnered with four countries, namely Estonia, Japan, Germany, and the Netherlands, to launch the fund.

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

52. Consider the following statements regarding Hydrogen Breakthrough Ironmaking Technology :

1. Swedish green steel venture HYBRIT, which had made the 'world's first' customer delivery of steel produced with using coal.

2. The steel was made using Hydrogen Breakthrough Ironmaking Technology, which uses 100% fossil-free hydrogen instead of coal and coke.

3. The venture has started delivering the fossil-free steel to the Volvo Group as part of its trial run.

Which of the above statements is/are correct ?

(a) 1 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 2 only

53. US-based Ohmium International has started India's first green hydrogen electrolyzer manufacturing unit at

(a) Pune, Maharashtra

(b) Hyderabad, Telangana

(c) Bengaluru, Karnataka

(d) Noida, Uttar Pradesh

54. Which one of the following ministries has repealed the Unmanned Aircraft Systems (UAS) Rules, 2021 and replaced the same with the liberalized Drone Rules, 2021 ?

(a) Ministry of Home Affairs

(b) Ministry of Defence

(c) Ministry of Science and Technology

(d) Ministry of Civil Aviation

55. Consider the following statements regarding Forum for Decarbonizing Transport :

1. NITI Aayog and World Resources Institute (WRI), India, jointly launched the 'Forum for Decarbonizing Transport' in India.

2. NITI Aayog is the implementing partner for India.

3. The aim of the project is to bring down the peak level of GHG emissions (transport sector) in Asia (in line with a well below 2-degree pathway), resulting in problems like congestion and air pollution.

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

56. Which one of the following national parks has become the first national park in India to be equipped with satellite phones ?

(a) Kaziranga National Park in Assam

(b) Sundarbans National Park in West Bengal

(c) Desert National Park In Rajasthan

(d) Indravati National Park in Chhattisgarh

57. Which one of the following cities has been named as the world's safest city from among 60 global cities, in Safe Cities Index 2021, released by the Economist Intelligence Unit (EIU) ?

(a) Yangon

(b) Copenhagen

(c) New York

(d) Toronto

58. The First-ever G20 Ministerial Conference on Women's Empowerment was held at

(a) Vienna, Austria

(b) Hamburg, Berlin

(c) Geneva, Switzerland

(d) Santa Margherita Ligure, Italy

59. Which one of the following countries did the Indian Navy participate in the U.S. Navy-led Southeast Asia Cooperation and Training (SEACAT) military exercise, to demonstrate its maritime manoeuvres ?

(a) Malaysia

(b) Australia

(c) Singapore

(d) New Zealand

60. Most serious students are happy students, and most serious students go to graduate school. Furthermore, all students who go to graduate school are overworked.

Which one of the following can be properly inferred from the statements above ?

(a) Most overworked students are happy students

(b) Some happy students are overworked

(c) All overworked students are serious students

(d) Some unhappy students go to graduate school

61. Some environmentalists question the prudence of exploiting features of the environment, arguing that there are no economic benefits to be gained from forests, mountains, or wetlands that no longer exist. Many environmentalists claim that because nature has intrinsic value it would be wrong to destroy such features of the environment, even if the economic costs of doing so were outweighed by the economic costs of not doing so.

Which one of the following can be logically inferred from the passage ?

(a) It is economically imprudent to exploit features of the environment.

(b) Some environmentalists appeal to a noneconomic justification in questioning the defensibility of exploiting features of the environment.

(c) Most environmentalists appeal to economic reasons in questioning the defensibility of exploiting features of the environment.

(d) Many environmentalists provide only a noneconomic justification in questioning the defensibility of exploiting features of the environment.

62. Some argue that laws are instituted at least in part to help establish a particular moral fabric in society. But the primary function of law is surely to help order society so that its institutions, organizations, and citizenry can work together harmoniously, regardless of any further moral aims of the law. Indeed, the highest courts have on occasion treated moral beliefs based on conscience or religious faith as grounds for making exceptions in the application of laws.

The statements above, if true, most strongly support which one of the following ?

(a) The manner in which laws are applied sometimes takes into account the beliefs of the people governed by those laws.

(b) The law has as one of its functions the ordering of society but is devoid of moral aims.

(c) Actions based on religious belief or on moral conviction tend to receive the protection of the highest courts.

(d) The way a society is ordered by law should not reflect any moral convictions about the way society ought to be ordered.

63. Unlike newspapers in the old days, today's newspapers and televised news programs are full of stories about murders and assaults in our city. One can only conclude from this change that violent crime is now out of control, and, to be safe from personal attack, one should not leave one's home except for absolute necessities.

Which one of the following, if true, would cast the most serious doubt on the conclusion ?

(a) Newspapers and televised news programs have more compre-hensive coverage of violent crime than newspapers did in the old days.

(b) National data show that violent crime is out of control every-where, not just in the author's city.

(c) Police records show that people experience more violent crimes in their own neighborhoods than they do outside their neighbor-hoods.

(d) Murder comprised a larger pro-portion of violent crimes in the old days than it does today.

64. Fact 1 : Jessica has four children.

Fact 2 : Two of the children have blue eyes and two of the children have brown eyes.

Fact 3 : Half of the children are girls.

If the first three statements are facts, which of the following statements must also be a fact ?

I. At least one girl has blue eyes.

II. Two of the children are boys.

III. The boys have brown eyes.

Select the correct answer using the code given below :

(a) II only

(b) I and III only

(c) II and III only

(d) None of the statements is a known fact

65. Children are in pursuit of a dog whose leash has broken. James is directly behind the dog. Ruby is behind James. Rachel is behind Ruby. Max is ahead of the dog walking down the street in the opposite direction. As the children and dog pass, Max turns around and joins the pursuit. He runs in behind Ruby. James runs faster and is alongside the dog on the left. Ruby runs faster and is alongside the dog on the right. Which child is directly behind the dog ?

(a) James

(b) Ruby

(c) Rachel

(d) Max

66. At the baseball game, Henry was sitting in seat 253. Marla was sitting to the right of Henry in seat 254. In the seat to the left of Henry was George. Inez was sitting to the left of George. Which seat is Inez sitting in ?

(a) 251

(b) 254

(c) 255

(d) 256

67. The difference between simple interest and compound interest on a sum for 2 years at 8% when the interest is compounded annually is ₹16. If the interest were compounded half yearly the difference in two interests would be nearly

   (a) ₹21·35

   (b) ₹24·64

   (c) ₹27·85

   (d) ₹29·94

68. A library has two books each having three copies and three other books each having two copies. In how many ways can all these books be arranged in a shelf so that copies of the same book are not separated ?

   (a) 80

   (b) 100

   (c) 120

   (d) 140

69. 21 mango trees, 42 apple trees and 56 orange trees have to be planted in rows such that each row contains the same number of trees of one variety only. Minimum number of rows in which the above trees may be planted is

   (a) 9

   (b) 12

   (c) 14

   (d) 17

70. A general wishes to draw up his 36562 soldiers in the form of a solid square. After arranging them, he found that some of them are left over. How many are left ?

   (a) 81

   (b) 75

   (c) 61

   (d) 52

71. A tank can be filled by 20 buckets each of capacity 13·5 litres. If the capacity of each bucket be 9 litres, how many buckets will fill the same tank ?

   (a) 30

   (b) 25

   (c) 20

   (d) 15

72. One side of a rhombus is 10 cm and one of its diagonals is 12 cm. The area of the rhombus is

   (a) 24 sq. cm

   (b) 48 sq. cm

   (c) 72 sq. cm

   (d) 96 sq. cm

73. Two boys begin together to write out a booklet containing 817 lines. The first boy starts with first line, writing at the rate of 200 lines an hour and the second boy starts with the last line. He writes line 817 and so on backwards proceeding at the rate of 150 lines an hour. At what line will they meet ?

   (a) 469th

   (b) 467th

   (c) 465th

   (d) 463rd

74. Rohith spends 40% of his monthly income on food items and 50% of the remaining on clothes and conveyance. He saves one-third of the remaining amount after spending on food, clothes and conveyance. If he saves ₹19,200 every year, what is his monthly income?

(a) ₹32,000

(b) ₹16,000

(c) ₹12,000

(d) ₹6,000

75. The value of $L^{-1}\left\{\dfrac{5s^2+8s-1}{(s+3)(s^2+1)}\right\}$ is

(a) $2e^{-3t}+3\cos t-\sin t$

(b) $2e^{-3t}-3\cos t+\sin t$

(c) $3e^{-3t}+2\cos t-\sin t$

(d) $3e^{-3t}-2\cos t+\sin t$

76. What is the Laplace transform of $2e^{3t}(4\cos 2t - 5\sin 2t)$?

(a) $\dfrac{8s+44}{s^2+6s-13}$

(b) $\dfrac{4s-44}{s^2-6s+13}$

(c) $\dfrac{4s+44}{s^2+6s-13}$

(d) $\dfrac{8s-44}{s^2-6s+13}$

77. A batch of 100 capacitors contains 73 which are within the required tolerance values, 17 which are below the required tolerance values, and the remaining are above the required tolerance values. What is the probability that when randomly selecting a capacitor and then a second capacitor, if both are within the required tolerance values when selecting with replacement?

(a) 0·3319

(b) 0·5329

(c) 0·7239

(d) 0·9249

78. The value of $\int_0^4 \sqrt{(16-x^2)}\,dx$ is

(a) π

(b) 2π

(c) 3π

(d) 4π

79. The value of $\int_0^2 \dfrac{3x}{\sqrt{(2x^2+1)}}\,dx$ is

(take positive values of square roots only)

(a) 1

(b) 2

(c) 3

(d) 4

80. What is the radius of gyration of a rectangular lamina of length 40 mm and width 15 mm about an axis through one corner, perpendicular to the plane of the lamina ?

(a) 1·27 cm

(b) 2·47 cm

(c) 3·67 cm

(d) 4·87 cm

81. By integration the area bounded by the three straight lines $y = 4 - x$, $y = 3x$ and $3y = x$ is

(a) 2 square units

(b) 3 square units

(c) 4 square units

(d) 5 square units

82. The power series for $ln\left(\dfrac{1+x}{1-x}\right)$ is

(a) $\left(x + \dfrac{x^3}{3} + \dfrac{x^5}{5} + \cdots\right)$

(b) $2\left(x - \dfrac{x^3}{3} + \dfrac{x^5}{5} - \cdots\right)$

(c) $2\left(x + \dfrac{x^3}{3} + \dfrac{x^5}{5} + \cdots\right)$

(d) $\left(x - \dfrac{x^3}{3} + \dfrac{x^5}{5} - \cdots\right)$

83. The mean value of $y = 3x^2 + 4x + 1$ between $x = -1$ and $x = 2$ is

(a) 2

(b) 4

(c) 6

(d) 8

84. What is the length of the curve $x = 2\cos^3\theta$, $y = 2\sin^3\theta$ between the points corresponding to $\theta = 0$ and $= \dfrac{\pi}{2}$?

(a) 2 units

(b) 3 units

(c) 4 units

(d) 5 units

85. What is the largest eigenvalue in modulus of the matrix $A = \begin{pmatrix} 2 & 3 & 2 \\ 4 & 3 & 5 \\ 3 & 2 & 9 \end{pmatrix}$ with an initial vector $(1, 1, 1)^T$ by power method ?

(a) 11·84

(b) 12·84

(c) 13·84

(d) 14·84

86. Reduce the matrix $A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & 2 & -1 \\ 4 & -1 & 1 \end{bmatrix}$ to the tridiagonal form.

(a) $\begin{bmatrix} 1 & -5 & 0 \\ -5 & \frac{2}{5} & \frac{1}{5} \\ 0 & \frac{1}{5} & \frac{13}{5} \end{bmatrix}$

(b) $\begin{bmatrix} 1 & 0 & -5 \\ -5 & \frac{2}{5} & -\frac{1}{5} \\ 0 & -\frac{13}{5} & \frac{1}{5} \end{bmatrix}$

(c) $\begin{bmatrix} 1 & -5 & 0 \\ -5 & -\frac{2}{5} & -\frac{13}{5} \\ 0 & \frac{1}{5} & \frac{1}{5} \end{bmatrix}$

(d) $\begin{bmatrix} 1 & -5 & 0 \\ -5 & -\frac{2}{5} & \frac{1}{5} \\ 0 & \frac{13}{5} & \frac{1}{5} \end{bmatrix}$

87. From the Taylor series for $y(x)$, what is the value of $y(0\cdot1)$ correct to four decimal places if $y(x)$ satisfies $y' = x - y^2$ and $y(0) = 1$?

(a) $0\cdot9138$

(b) $0\cdot7254$

(c) $0\cdot5286$

(d) $0\cdot3524$

88. What is the shape of the curve represented by $\dfrac{x}{5} = \sqrt{\left[1 + \left(\dfrac{y}{2} \right)^2 \right]}$?

(a) Hyperbola

(b) Rectangular hyperbola

(c) Parabola

(d) Ellipse

89. What is the particular solution of the differential equation $5\dfrac{dy}{dx} + 2x = 3$ if the boundary conditions are $y = \dfrac{7}{5}$ and $x = 2$?

(a) $y = \dfrac{3x}{5} - \dfrac{x^2}{5} + 1$

(b) $y = \dfrac{3x}{5} + \dfrac{x^2}{5} - 2$

(c) $y = \dfrac{5x}{3} - \dfrac{x^2}{3} + 1$

(d) $y = \dfrac{5x}{3} + \dfrac{x^2}{3} - 2$

90. Which of the following factors are included in product realization process ?

1. Marketing functions to assess customer requirements

2. Documentation of the design

3. Legal requirements

Select the correct answer using the code given below :

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

91. In general, which one of the following is NOT included in the list of parts or the bill of materials in an engineering drawing sheet ?

(a) Part number

(b) Material Name

(c) Cost

(d) Quantity

92. Continuous thin (narrow) with zigzags (straight) lines are generally used to represent

(a) long-break line

(b) hidden outline

(c) visible outline

(d) reference line

93. When the receding lines are drawn to full size scale and the projectors inclined at an angle of 30° or 45° or 60° to the plane of projection, such oblique projection is known as

(a) Cabinet projection

(b) Vertical projection

(c) Cavalier projection

(d) Horizontal projection

94. Which one of the following statements is correct about oblique projection ?

(a) The object is drawn with the reduced (about 82%) dimensions

(b) All the faces of the object are distorted in the shape and size

(c) Projectors from an object are parallel to each other and perpendicular to the plane of picture

(d) The faces of object which are perpendicular to the plane of projection will be distorted in the shape and size

95. Which one of the following methods is used when the non-isometric lines or their ends lie in isometric planes ?

(a) Intersection method

(b) Box method

(c) Co-ordinate method

(d) Offset method

96. If a line is perpendicular to the V.P. and its V.T. coincides with its front view which is a point, then

(a) V.T. is a point on H.P.

(b) H.T. is a point on V.P.

(c) it has no V.T.

(d) it has no H.T.

Each of the next **Four (04)** items consists of two statements, one labelled as the 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements carefully and select the answers to these items using the codes given below :

Codes :

   (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

97. Statement (I) : The drawings and machining processes can be automated using CAD/CAM change the primary function of these drawings and processes.

   Statement(II) : The primary function is to provide information about the product to the designer and production people.

98. Statement (I) : Environmental pollution has become global problem.

   Statement(II) : The rapidly growing human population, rapid urbanization, intensive agriculture and industrialization together with human activities resulted in the environmental pollution.

99. Statement (I) : Content is the heart of any IT project.

   Statement(II) : Implementation and maintenance of e-government projects through IT professional hired from the market is likely to result in failure of the project as the organization is bound to disown such outsiders.

100. Statement (I) : Social involvement discourages additional government regulation and intervention.

   Statement(II) : Social involvement can create a weakened international balance of payments situation.

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