

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

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

Test Booklet Series

Serial No.

0131249

**TEST BOOKLET**  
**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 CAREFULLY 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 (0.33)** 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. Match the following :

I	II
A. Thompson	1. The concept of converting mechanical work into heat
B. James P. Joule	2. The theory of relativity
C. Max Planck	3. The energy characteristics of light
D. Albert Einstein	4. The energy equivalence between heat, work and electric power

Select the correct matching using the code given below :

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

2. According to UNEP, which of the following is/are the major component/s of air pollution ?

1. SO<sub>2</sub>
2. O<sub>3</sub>
3. CO
4. NO<sub>2</sub>

Select the correct answer using the code given below :

- (a) 2 and 3 only
  - (b) 2 only
  - (c) 2, 3 and 4 only
  - (d) 1, 2, 3 and 4
3. Which one of the following is a 'soft coal' ?
- (a) anthracite
  - (b) bituminous
  - (c) lignite
  - (d) magnetite

4. Which one of the following is NOT correctly matched pair regarding the regional biodiversity ?

- (a) Point richness : The number of species that can be found at a single point in a given space
- (b) Alpha richness : The number of species found in a small heterogeneous area
- (c) Beta richness : The rate of change in species composition across different habitats
- (d) Gamma richness : The rate of change across large landscape gradients

5. Energy services for sustainable development are directly linked to

1. Poverty
2. Lifestyles
3. Women
4. Deforestation

Select the correct answer using the code given below :

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

6. Match the following :

I	II
A. Oligotrophic lakes	1. created due to construction of dams
B. Dystrophic lakes	2. low pH and high humic acid content
C. Meromictic lakes	3. low nutrient concentration
D. Impoundments	4. rich in salts and permanently stratified

Select the correct matching using the code given below :

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

7. Which one of the following is NOT included in the 27 principles issued at the Rio-92 UN Conference on the Environment and Development ?

- (a) The right to development that meets the needs of present and future generations
- (b) Right to safety from natural disasters
- (c) Protection to the environment in times of armed conflict
- (d) Youth mobilization for a global partnership

8. What are the objectives and functions of state financial corporations ?

1. The main function is to provide non-term loans for the acquisition of land, building, plant, machinery and other movable assets.
2. To finance expansion, modernization and upgradation of technology in the existing units.
3. To assist for the promotion of industry by the rural and urban artisans.
4. Providing seed capital assistance under the scheme of Industrial Development Bank of India.

Select the correct answer using the code given below :

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

9. From the following, which facilities are provided for units in the export processing zone ?

1. Developed plots/ready-buildings to suit project requirements.
2. Second hand capital goods allowed to be exported.
3. Foreign equity participation up to 100% permissible.
4. Assured power supply, preferential power connection.

Select the correct answer using the code given below :

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

10. Which one of the following is NOT the purpose of the organization breakdown structure ?

- (a) To provide a framework to summarize organization unit work performance
- (b) Do not tie the organizational unit to cost control accounts
- (c) Identify organization units responsible for work packages
- (d) How the firm has organized to discharge work responsibility

11. Phillip Kotler argues that the 4 Ps which represent the seller's thinking more than buyer's thinking can be translated into the 4 Cs. Match the following :

*4 Ps of  
Marketing  
Planning*

*4 Cs of  
Marketing  
Planning*

- |              |                           |
|--------------|---------------------------|
| A. Product   | 1. Customer communication |
| B. Price     | 2. Customer value         |
| C. Place     | 3. Customer costs         |
| D. Promotion | 4. Customer convenience   |

Select the correct matching using the code given below :

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

12. The Boston Consulting Group matrix classifies business in four categories as "STAR", "QUESTION MARK", "CASH COWS". Which one of the following is the fourth one ?

- (a) CATS
- (b) HORSES
- (c) DOGS
- (d) HENS

13. Under which one of the following circumstances is the project accepted as worthwhile, keeping the principal non-discounting criteria ?

- (a) The payback period (PBP) > target period
- (b) The payback period (PBP) < target period
- (c) The payback period (PBP) = target period
- (d) The payback period (PBP) = 0

14. The purpose of oil in a transformer is to

- (a) protect the transformer from rusting
- (b) avoid wear and tear of the transformer
- (c) transfer heat from winding and core to the cooling surfaces of the transformer
- (d) avoid noise in a transformer

15. For a semiconductor to be called as p-type semiconductor, which one of the following element impurities are added to a pure semiconductor ?

- (a) Phosphorus
- (b) Arsenic
- (c) Antimony
- (d) Boron

16. Impure semiconductor

- (a) has more conductivity in contrast to pure semiconductor
- (b) has less conductivity in contrast to pure semiconductor
- (c) has electrons and holes in equal number
- (d) has a fermi level which is in the centre of conduction and valence bands

17. Which one of the following is the disadvantage of ion-implantation over diffusion doping ?

- (a) It is a low temperature process
- (b) Point imperfections are not produced
- (c) Shallow doping is possible
- (d) Gettering is possible

18. Which one of the following is correct in n-p-n transistor ?

- (a) Collector and emitter terminals can be exchanged
- (b) Collector is heavily doped, base width is small and emitter area is large
- (c) Emitter, base and collector regions are equally doped
- (d) Emitter is heavily doped, base width is small and collector area is large

19. Which one of the following factors does NOT characterize the formation of non-crystalline structure ?
- (a) Presence of primary bonds in the directions
  - (b) Non-formation of three-dimensional primary bond
  - (c) Weak secondary bond
  - (d) Open network of the atomic packing
20. Which one of the following protocols is used to address the true routing decisions problems ?
- (a) Exterior Gateway Protocol
  - (b) Border Gateway Protocol
  - (c) Open Shortest Path First Protocol
  - (d) Interior Gateway Routing Protocol
21. Which one of the following standards is used in vehicular communication system ?
- (a) IEEE 802.11a
  - (b) IEEE 802.11p
  - (c) IEEE 802.11g
  - (d) IEEE 802.11h
22. Which of the following network metrics are used to evaluate the performance of a network ?
- (a) Throughput and Delay
  - (b) Reliability and Security
  - (c) Topology and Type of connection
  - (d) Portability and Security
23. Which of the following things are defined by uniform resource locator for specifying the information on the internet ?
- (a) protocol, host computer, throughput and delay
  - (b) host computer, destination computer and delay
  - (c) throughput, delay, port and path
  - (d) protocol, host computer, port and path
24. Which one of the following documents are created and handled by the Common Gateway Interface (CGI) technology ?
- (a) Dynamic documents
  - (b) Static documents
  - (c) Tampered documents
  - (d) Linked documents
25. Which one of the following learnings uses web technology to conduct conventional classes with distant learners ?
- (a) Learner-led e-learning
  - (b) Instructor-led e-learning
  - (c) Telementoring and e-coaching
  - (d) Facilitated e-learning

26. Which one of the following frameworks is developed to assess the value of the increasing investments made on e-governance projects in terms of service orientation, technology architecture, replicability and sustainability in various states across the country ?

- (a) eTechnology Group@IMRB
- (b) e-Governance Assessment Framework
- (c) Sustainable Access in Rural India
- (d) e-Governance Action Plan

27. Which one of the following services does NOT come under category of Cloud computing ?

- (a) IaaS (Infrastructure as a Service)
- (b) SaaS (Software as a Service)
- (c) PaaS (Platform as a Service)
- (d) BDaaS (Big data as a Service)

28. What is the key size of Data Encryption Standard algorithm in cryptography ?

- (a) 56 bit
- (b) 62 bit
- (c) 168 bit
- (d) 128 bit

29. Which one of the following statements is NOT correct about the codes of conduct ?

- (a) These cover general guiding principles
- (b) Their purpose is to regulate the conduct of members on various transactions

(c) These are the broader sets of principles that are designed to inform specific laws or government actions

(d) These translate the values into specific behavioral standards, keeping in mind the possible reflection on the stakeholders' interest

30. The famous statement "The weak can never forgive. Forgiveness is the attribute of the strong" is given by

- (a) Swami Vivekananda
- (b) Mahatma Gandhi
- (c) Martin Luther
- (d) Sri Aurobindo

31. Match the following :

I	II
A. Act Utilitarian Theory	1. John Locke
B. Rule Utilitarian Theory	2. Immanuel Kant
C. Duty Ethics Theory	3. Richard Brandt
D. The Rights Theory	4. J. S. Mill

Select the correct matching using the code given below :

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

32. Which philosopher suggested Wisdom, Courage, Temperance and Justice as four 'cardinal virtues' ?

- (a) Aristotle
- (b) Aquinas
- (c) Socrates
- (d) Plato

33. 'Groupthink', a noteworthy feature of the organizational settings within which engineers work and deliberate in groups, has been suggested by

- (a) Abraham Maslow
- (b) Irving Janis
- (c) B. F. Skinner
- (d) Christopher Meyers

34. Select inappropriate statement about integrity

- (a) It involves the discovery and communication of the truth
- (b) It leads to a concern for the whole situation in decision-making, including an awareness of the professional's own attitudes, standards and value systems
- (c) It is simply truthfulness or avoidance of lying
- (d) It ensures that the professional does not accept 'moral distance'

35. Whistleblowing in an organizational set up affects :

1. Peer professional relationships
2. Relationships with management
3. Family relations

Which of the above statements is/are correct ?

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

36. Carol Gilligan is associated with

- (a) the natural justice
- (b) the responsibility
- (c) the principle of loyalty
- (d) the ethics of care

37. Hooch & Bootlegging refer to

- (a) the prohibition law on unethical practices related to liquor
- (b) laws against giving money to beggars as a generous act
- (c) food adulteration rules
- (d) laws on checking the illegal business of duplicate goods

38. The Ministry of Sports and Youth Affairs has recently approved the inclusion of four indigenous games to be part of Khelo India Youth Games 2021. Which one of the following is NOT included ?

- (a) Thang-Ta
- (b) Lagori
- (c) Kalaripayattu
- (d) Gatka

39. Which one of the following is the latest in series being organized as the largest virtual gathering to create dialogues, and accelerate innovation in agriculture ?

- (a) Agri-India Hackathon 2020
- (b) National Agriculture Higher Education Project
- (c) ENSURE
- (d) National Mission for Sustainable Development

40. Match the following :

I	II
A. Utkarsh Bangla Scheme	1. West Bengal
B. Placement Linked Skill Training Programme	2. Rajasthan
C. SURYA Scheme	3. Haryana
D. Employment Linked Skill Training Programme	4. Assam

Select the correct matching using the code given below :

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

41. With a view to encourage and promote Indian artisans and their handicraft, *Hunar Haat* offers an effective platform. Where was the 22nd *Hunar Haat* held ?

- (a) Jaipur
- (b) Ferozpur
- (c) Rampur
- (d) Bharatpur

42. Which one of the following is NOT correct pair of Author-Book published in the year 2020 ?

- (a) Arundhati Roy : Azadi
- (b) Jairam Ramesh : A Chequered Brilliance
- (c) Zadie Smith : Intimations
- (d) Diane Cook : One Arranged Murder

43. Which one of the following statements is NOT correct regarding the National Education Policy 2020 in India ?

- (a) It proposes sweeping changes in the education system from pre-primary to PhD and skill development
- (b) It states that universities from among top 100 in the world will be able to set up campuses in India
- (c) It expects that India will achieve 60% GER by 2030
- (d) It suggests NAAC to be merged with UGC and AICTE

44. According to the National Institutional Ranking Framework 2020, which institute was on the top in overall ranking ?

- (a) Indian Institute of Technology, Madras
- (b) Indian Institute of Science, Bengaluru
- (c) Indian Institute of Technology, Delhi
- (d) Indian Institute of Technology, Bombay

45. Consider the following statements about ingenuity :

1. It is man's decades-long quest to fly a helicopter on Mars.
2. It is 0.6 metres tall and weigh less than 1.8 kg.
3. It aims to look for habitability.

Which of the above statements is/are correct ?

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

46. Name the NASA astronaut who after setting the record of 328-day stay on the International Space Station (ISS), returned through Earth's atmosphere and landed on the Kazakhstani desert on 6th Feb 2020

- (a) Josh Cassada
- (b) Jeanette Epps
- (c) Christina Koch
- (d) Peggy Whitson

47. The Thirteenth Meeting of the Conference of the Parties to the Convention on the Conservation of Migratory Species of Wild Animals (CMS COP 13) in 2020 was held in

- (a) Brazil
- (b) India
- (c) Indonesia
- (d) Canada

48. Consider the following statements with respect to the schemes initiated by the Government of India in 2020.

1. NISHTHA is a teachers training program.
2. SVANidhi is a scheme to facilitate artisans to access affordable working capital loan.
3. SATYABHAMA is a scheme to promote research and development in science and technology.
4. Manodarpan is a scheme to promote tourism in rural parts of India.

Which of the above statements is/are correct ?

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

49. Which iconic figure set a Guinness World Record in 2020 for receiving 1 million followers for debut on Instagram in just 4 hours and 44 minutes ?

- (a) Bong Joon-ho
- (b) Amy Coney Barrett
- (c) David Attenborough
- (d) Sanna Marin

50. Which one of the following statements is NOT correct about the Atal Tunnel ?

- (a) It is the highest altitude tunnel in the world
- (b) It was inaugurated on 03 October 2020 in Rohtang
- (c) It connects Manali to Lahaul-Spiti valley
- (d) It is capable of handling 5000 cars and 2500 trucks per day with maximum speed of 80 kmph

51. Who received the prestigious Abel Prize for the year 2020 ?

- (a) Eric Adelberger and Blayne Heckel
- (b) Hillel Furstenberg and Gregory Margulis
- (c) Yvonne Farrell and Shelley McNamara
- (d) Nina Holden and Lisa Piccirillo

52. Select the incorrect pair of the 2020 Nobel Prize Winners with their respective areas of contribution :

- (a) Louise Gluck – Literature
- (b) Andrea Ghez – Physics
- (c) Jennifer A. Doudna – Chemistry
- (d) Harvey J. Alter – Economic Sciences

53. What is the angle between the hour hand and minute hand of a clock at 3:30 ?

- (a)  $105^\circ$
- (b)  $180^\circ$
- (c)  $75^\circ$
- (d)  $90^\circ$

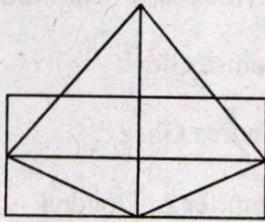
54. Sum of the series  $2^2+4^2+6^2+\dots+20^2$  is

- (a) 1040
- (b) 1540
- (c) 2540
- (d) 3080

55. If  $A \times B$  means  $(A^2+B^2)$ , then the value of  $5 \times (4 \times 3)$  is

- (a) 60
- (b) 300
- (c) 650
- (d) 710

56. The number of triangles in the given figure is



- (a) 11  
 (b) 13  
 (c) 15  
 (d) 17
57. Statement 1 : A has more coins than B.  
 Statement 2 : B has fewer coins than C.  
 Statement 3 : C has fewer coins than A.  
 If the statement 1 is true and statement 2 is false, then the statement 3 is
- (a) True  
 (b) False  
 (c) Uncertain  
 (d) Insufficient data
58. If  $\frac{x+1}{x-1} = \frac{a}{b}$  and  $\frac{1-y}{1+y} = \frac{b}{a}$ , then the

value of  $\frac{x-y}{1+xy}$  is

- (a)  $\frac{2ab}{a^2-b^2}$   
 (b)  $\frac{a^2-b^2}{2ab}$

- (c)  $\frac{a^2+b^2}{2ab}$   
 (d)  $\frac{a^2-b^2}{ab}$

59. If  $(2x+3y) : (3x+5y) = 18 : 29$ , then the value of  $x : y$  is

- (a) 4 : 1  
 (b) 4 : 5  
 (c) 3 : 4  
 (d) 3 : 1

60. A is twice as good a workman as B and together, they finish a piece of work in 18 days. In how many days will A alone finish the work ?

- (a) 28 days  
 (b) 30 days  
 (c) 27 days  
 (d) 29 days

61. In how many years will a sum of ₹800 at 10% per annum compounded semi-annually become ₹926.10 ?

- (a)  $1\frac{1}{3}$  years  
 (b)  $1\frac{1}{2}$  years  
 (c)  $2\frac{1}{3}$  years  
 (d)  $2\frac{1}{2}$  years

62. The diagonal of a rectangle is  $\sqrt{41}$  cm and its area is 20 sq.cm. The perimeter of the rectangle is
- (a) 9 cm
  - (b) 18 cm
  - (c) 20 cm
  - (d) 41 cm
63. Four persons are chosen at random from a group of 3 men, 2 women and 4 children. The chance that exactly 2 of them are children, is
- (a)  $\frac{2}{9}$
  - (b)  $\frac{4}{5}$
  - (c)  $\frac{7}{12}$
  - (d)  $\frac{10}{21}$
64. A man walks 1 km to East and then he turns to South and walks 5 km. Again, he turns to East and walks 2 km. After, he turns to North and walks 9 km. Now, how far he is from his station point ?
- (a) 3 km
  - (b) 4 km
  - (c) 5 km
  - (d) 7 km
65. The population of a village is 5500. If the number of males increases by 11% and the number of females increases by 20% then the population becomes 6330. The population of female in the village is
- (a) 2000
  - (b) 2500
  - (c) 3000
  - (d) 3500
66.  $A, B, C, D$  and  $E$  are five different integers. When written in the ascending order of values, the difference between any two adjacent integers is 4.  $D$  is the greatest and  $A$  is the least.  $B$  is greater than  $E$  but less than  $C$ . The sum of the integers is equal to  $E$ . What is the positive difference between the lowest and the highest integers ?
- (a) 8
  - (b) 6
  - (c) 16
  - (d) 18
67. Mary introduces Jack as the son of the only daughter of my father's wife. How is Jack related to Mary ?
- (a) Brother
  - (b) Son
  - (c) Husband
  - (d) Father

68. The value of  $\int_0^1 \int_0^x (x^2 + y^2) dA$ , where  $dA$  indicates small area in  $xy$ -plane, is

- (a)  $\frac{1}{2}$  sq. units
- (b)  $\frac{1}{3}$  sq. units
- (c)  $-\frac{1}{2}$  sq. units
- (d)  $-\frac{1}{3}$  sq. units

69. If  $x = uv$ ,  $y = \frac{u+v}{u-v}$ , then  $\frac{\partial(u,v)}{\partial(x,y)}$  is

- (a)  $\frac{(u-v)^2}{4uv}$
- (b)  $\frac{(u+v)^2}{4uv}$
- (c)  $\frac{(u-v)}{4uv}$
- (d)  $\frac{(u+v)}{4uv}$

70. If  $u = x^3 + y^3$  where

$$x = a \cos t, y = b \sin t, \text{ then } \frac{du}{dt} =$$

- (a)  $-3a^3 \cos^2 t \sin t + 3b^3 \sin^2 t \cos t$
- (b)  $3a^3 \sin^2 t \cos t + 3b^3 \cos^2 t \sin t$
- (c)  $3b \sin^2 t \cos t + 3a^3 \sin^2 t \cos t$
- (d)  $-3a^3 \sin t + 3b^3 \cos^2 t \sin t$

71. Suppose that a book of 600 pages contains 40 printing mistakes. Assume that these errors are randomly distributed throughout the book and  $x$ , the number of errors per page has a Poisson distribution. What is the probability that 10 pages selected at random will be free of errors?

- (a)  $\frac{1}{3}e^{-1}$
- (b)  $2e^{-\frac{1}{3}}$
- (c)  $e^{-\frac{2}{3}}$
- (d)  $\frac{1}{3}e^{-2}$

72. The highest Eigen value of the  $2 \times 2$

matrix  $\begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$  is

- (a) -1
- (b) -5
- (c) 5
- (d) 1

73. If  $\Delta = \begin{vmatrix} p p^2 (p^3 - 1) \\ q q^2 (q^3 - 1) \\ r r^2 (r^3 - 1) \end{vmatrix} = 0$ ,

in which  $p, q, r$  are different. The value of  $pqr$  is

- (a) 3
- (b) 1
- (c) 2.5
- (d) 3.5

74. If  $A = \begin{bmatrix} -1 & 2 & 3 & -2 \\ 2 & -5 & 1 & 2 \\ 3 & -8 & 5 & 2 \\ 5 & -12 & -1 & 6 \end{bmatrix}$ , then the

rank of the matrix  $A$  is

- (a) 2
- (b) 5
- (c) 4
- (d) 3

75. If  $A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 0 & -1 \\ 1 & 2 & 3 \end{bmatrix}$ , then which one of

the following is correct ?

- (a)  $A^3 - 3A^2 - 4A + 11I = 0$
- (b)  $A^3 - 4A^2 - 3A + 11I = 0$
- (c)  $A^3 + 4A^2 - 3A + 11I = 0$
- (d)  $A^3 - 3A^2 + 4A + 11I = 0$

76. The Maclaurin's series expansion of  $e^{\sin x}$  is

- (a)  $1 + x - \frac{x^2}{2} + \frac{x^4}{12} - \dots$
- (b)  $1 - x + \frac{x^2}{2} - \frac{x^4}{8} + \dots$
- (c)  $1 + x + \frac{x^2}{2} - \frac{x^4}{8} + \dots$
- (d)  $1 + x + \frac{x^2}{2} - \frac{x^4}{12} + \dots$

77. The real root of  $x^3 + x^2 + 3x + 4 = 0$  correct to four decimal places, obtained using Newton Raphson method is

- (a) -1.3334
- (b) 1.3221
- (c) -1.2229
- (d) 1.2929

78. The value of  $\int_0^6 \frac{dx}{1+x^2}$  by Simpson's  $\frac{1}{3}$  rule is

- (a) 1.3111
- (b) 1.3941
- (c) 1.3735
- (d) 1.3662

79. The value of  $\sum_1^n \frac{1}{(x+3)(x+4)}$  is

- (a)  $\frac{n}{n+2}$
- (b)  $\frac{2n}{n+1}$
- (c)  $\frac{n}{4(n+4)}$
- (d)  $\frac{n}{2(n+2)}$

80. The surface which intersects the surfaces of the system  $z(x + y) = c(3z + 1)$  orthogonally and which passes through the circle  $x^2 + y^2 = 1, z = 1$ , is given by

(a)  $x^2 + y^2 = 2z^3 + z^2 - 2$

(b)  $x^2 - y^2 = z^3 + z + 1$

(c)  $x^2 - y^2 = z^2 + 4$

(d)  $x^2 + y^2 = z^3 + z^2 + 4$

81. The surface area of that portion of the surface  $z = \sqrt{4 - x^2}$  that lies above the rectangle  $R$  in the  $xy$ -plane whose coordinates satisfy  $0 \leq x \leq 1$  and  $0 \leq y \leq 4$  is equal to

(a)  $4 - \pi$

(b)  $\frac{3}{4}\pi^2$

(c)  $\frac{\sqrt{3}}{5}\pi$

(d)  $\frac{4}{3}\pi$

82. The value of  $y$  at  $x = 0.1$  to five places of decimals, by Taylor's series method,

given that  $\frac{dy}{dx} = x^2y - 1, y(0) = 1$ , is

(a) 0.68281

(b) 0.81122

(c) 0.90033

(d) 0.70127

83. In which one of the following projection types, the object is kept in such a way that its three mutual perpendicular edges make equal angles with the plane of projection and the object stands on one of its corners ?

(a) Non Isometric projection

(b) Oblique projection

(c) Isometric projection

(d) Point projection

84. The creative design routes are practised by adopting following steps :

1. Concentration

2. Illumination

3. Preparation

4. Verification

5. Incubation

Arrange the above steps in correct sequence :

(a) 3, 1, 5, 2, 4

(b) 3, 5, 2, 1, 4

(c) 3, 2, 1, 5, 4

(d) 3, 1, 2, 5, 4

85. Points to be remembered while dimensioning :

1. Dimensions are to be placed on the view which clearly express the relevant features.
2. Once dimension is marked in one view, it should not be repeated in another view.
3. Dimensions are to be drawn from hidden lines.
4. Dimensions should be given from the base line or centre line of a hole.

Which of the above statements are correct ?

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

86. The design of highway interchanges involves the application of the geometry of

- (a) circle arcs
- (b) semi ellipse
- (c) hyperbola
- (d) semi-circle

87. On a multi view drawing a visible or invisible line represents the following :

1. Intersection of two surfaces
2. Edge view of a surface
3. Limiting elements of a surface

Which of the above points are correct ?

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

88. On a view showing assembled parts, section lines on adjacent pieces are drawn in

- (a) same directions usually at an angle of  $90^\circ$
- (b) opposite directions usually at an angle of  $45^\circ$
- (c) opposite directions usually at an angle of  $30^\circ$
- (d) same directions usually at an angle of  $60^\circ$

89. Oblique drawing has the following advantage over isometric drawing :

- (a) Distortion can be increased by foreshortening measurements along the receding axis
- (b) A greater choice is permitted in orthographic top view
- (c) Circular or irregular outlines on the front face show in their true shape
- (d) Oblique drawing is often less flexible

90. Most of Deming's deadly diseases involve
- (a) immobility of management
  - (b) a long term orientation
  - (c) a lack of understanding of variation
  - (d) high degree of constancy of purpose
91. Which one of the following rules is NOT used for identifying an out-of-control process ?
- (a) A process is assumed to be out-of-control if a single point plots outside the control limits
  - (b) A process is assumed to be out-of-control if there is a run of six or more consecutive points steadily increasing or decreasing
  - (c) A process is assumed to be out-of-control if nine or more consecutive points fall to one side of the centre line
  - (d) A process is assumed to be out-of-control if two or more consecutive points fall beyond the  $1\sigma$  limit on the same side of the centre line
92. Which one of the following is NOT a major quality control method ?
- (a) Inspection
  - (b) Testing
  - (c) Loading
  - (d) Sampling
93. Which one of the following is the responsiveness to business issues in commercial performance ?
- (a) Frequency of overshipments
  - (b) Quotations
  - (c) Timely reconciliation of cumulative shipments
  - (d) Timely supplier response to problems
94. Which one of the following is NOT a component of total variability of measured observations ?
- (a) Variation between operators
  - (b) Variability due to operators
  - (c) Variability between parts dimensions
  - (d) Variation due to interaction between operators and parts
95. Which one of the following unique characteristics of the construction process makes TQM difficult to implement ?
- (a) The construction process is relatively short in duration
  - (b) A low percentage of the labour at a construction project only work for the construction firm for a short time period
  - (c) Project owners take a long term view to control projects
  - (d) Construction projects are multiple, each project being somewhat same

96. Rearrange the following steps involved in construction of pareto diagram in the proper order.

1. Determine how relative importance is to be judged.
2. Decide on the data categorization system.
3. Rank the categories from most important to least important.
4. Plot a bar graph.
5. Compute the cumulative frequency of the data categories in their chosen order.

Select the correct answer using the code given below :

- (a) 1, 3, 2, 4, 5
- (b) 2, 3, 1, 5, 4
- (c) 2, 1, 3, 5, 4
- (d) 1, 2, 3, 4, 5

**Directions :**

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) : Issue of shares is the most common method especially to raise long-term funds.

Statement(II) : The equity shareholders are residual owners who have restricted claim on income as dividend.

98. Statement (I) : The slip mode of deformation is the common mode in only one crystal at ambient and elevated temperature.

Statement(II) : A slip plane and a slip direction that lies on it together constitute a slip system.

99. Statement (I) : Major e-Governance projects bear fruit only when application of IT is preceded by process re-engineering.

Statement(II) : Initiatives which save the citizens' time, money and effort are able to succeed even when back-end computerization is not done.

100. Statement (I) : Moral pluralists maintain that there are moral truths, but they do not form a body of coherent and consistent truths in the way that one finds in science or mathematics.

Statement(II) : Moral truth are real, but partial.

## SPACE FOR ROUGH WORK

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