Question Booklet Series: **A** *Question Booklet Serial No.:* **100085**

PULEET – 2024

Important: *Please consult your Admit Card/Roll No. slip before filling your Roll Number on the Test Booklet and Answer Sheet.*

Roll No. ***(In Figure)*** ***(In Words)***

O.M.R. Answer Sheet Serial No.

Signature of Candidate: _____ *Signature of Invigilator:* _____

Time: 100 Minutes **Number of Questions: 100** **Maximum Marks: 100**

DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO.

INSTRUCTIONS:

1. Write your Roll No. on the Questions Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Question Booklet Serial No. on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Gel Pen**.
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. Please check that this Question Booklet contains **100** Questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of Test.
5. Each question has four alternative answer (A,B,C,D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Gel Pen. There shall be negative marking for wrong answer, ¼ of the marks of the question will be deducted for every wrong answer.**
6. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Booklet. No marks will be deducted in such cases.
7. The mediums of examination shall be English only.
8. **35 minutes extra would be given to the visually handicapped/PwD Candidates.**
9. **Darken** the bubbles in the OMR Answer Sheet according to the Serial No. of the question given in the Question Booklet.
10. If you want to change an already marked answer, erase the shade in the darkened bubble completely.
11. For rough work only the blank sheet at the end of the Question Booklet be used.
12. The University will provide Logarithmic table. Borrowing of log table or other material is not allowed.
13. The Answer Sheet is designed for computer evaluation. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e. not following the instructions completely, shall be of the candidate only.**
14. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
15. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
16. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistance or found giving or receiving assistance or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
17. **Communication equipment such as Pager, Cellular phones, wireless set, scanner, camera or any electronic/digital gadget etc., is not permitted inside the examination hall. Use of calculators is not allowed.**
18. The candidates will not be allowed to leave the Examination Hall/Room before the expiry of the allotted time.

1. If x^3y^2 is an integrating factor of $(6y^2 + axy)dx + (6xy + bx^2)dy = 0$, where $a, b \in \mathbb{R}$, then
(A) $3a - 5b = 0$ (B) $3a + 5b = 0$ (C) $2a - b = 0$ (D) $2a + b = 0$

2. Vectors u and v are such that $|u| = 4$ and $|v| = 6$ and $u \cdot v = 10$. The value of $v \cdot (u + v)$ is
(A) 20 (B) 26 (C) 46 (D) 60

3. If $A + B = C$, then $\tan A \tan B \tan C =$
(A) $\tan C + \tan A - \tan B$ (B) $\tan C - \tan A - \tan B$
(C) $\tan A - \tan B - \tan C$ (D) $\tan A + \tan B - \tan C$

4. Let $x = 1 + a + a^2 + a^3 + \cdots \infty$ $(a < 1)$ and $y = 1 + b + b^2 + b^3 + \cdots \infty$ $(b < 1)$. Then the value of $1 + ab + a^2b^2 + \cdots \infty$ is
(A) $\frac{xy}{x+y-1}$ (B) $\frac{xy}{x+y+1}$ (C) $\frac{xy}{x-y-1}$ (D) $\frac{xy}{x-y+1}$

5. A line makes and angle α, β, γ with the x, y, z axes. Then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is
(A) 0 (B) 1 (C) 2 (D) 3

6. The area between the curve $y = x\,(x-1)(x-2)$ and x – axis is
(A) 1/4 (B) 1/2 (C) 1 (D) 0

7. The system of linear equations $x + y - z = 1$; $2x + 3y + kz = 3$; $x + ky + 3z = 2$ where $k \in \mathbb{R}$, has an infinite number of solutions. What will be the value of k?
(A) $k = 3$ (B) $k = -3$ (C) $k = 2$ (D) $k = -2$

8. Evaluate $\oint_C \vec{F} \cdot d\vec{r}$ for $\vec{F} = (x^2 + y^2)\hat{\imath} - 2xy\,\hat{\jmath}$ taken over the rectangle bounded by the lines $x = \pm a, y = 0, y = b$.
(A) $-4ab^2$ (B) $2ab^2$ (C) $4ab^2$ (D) $-2ab^2$

9. The directional derivative of $\frac{1}{r}$ in the direction of $\vec{r}$ is
(A) $\frac{1}{r^2}$ (B) $-\frac{1}{r^2}$ (C) $\frac{1}{r^3}$ (D) $-\frac{\vec{r}}{r^3}$

10. If $f(x, y) = 0$, then $\frac{dy}{dx}$ is equal to
(A) $-\frac{f_x}{f_y}$ (B) $\frac{f_x}{f_y}$ (C) $\frac{f_y}{f_x}$ (D) $-\frac{f_y}{f_x}$

11. A proton of mass 1.6×10^{-27} kg, revolves in a circular path of radius 0.1 m. Calculate the angular velocity of the proton if it is acted upon by a centripetal force of 1.6×10^{-12} N.
(A) 10^8 rad/s (B) 10^9 rad/s (C) 10^{10} rad/s (D) 10^4 rad/s

12. At nodes in stationary waves, the
(A) change in pressure and density are minimum
(B) strain is zero
(C) change in pressure and density are maximum
(D) energy is maximum

13. A beam of light strikes a piece of glass at an angle of 60° and the reflected beam is completely polarized. The refractive index of glass is
(A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{1}{3}$ (D) $\sqrt{3}$

14. In Young's double slit experiment, the width of the fringes obtained from a light of wavelength 500 nm is 3.6 mm. What is the fringe width id the apparatus is immersed in a liquid of refractive index 1.2?
(A) 2 mm (B) 2.6 mm (C) 3 mm (D) 3.2 mm

15. How much heat does it take to raise the temperature of 10.0 kg of water by 1.0 °C?
(A) 94kJ (B) 100kJ (C) 84kJ (D) 42kJ

16. Initial volume and pressure of a gas are V and P. If it is adiabatically expanded to volume 4V, new pressure will be.....(Given, $\gamma = 1.5$)
(A) $\frac{P}{4}$ (B) $\frac{P}{6}$ (C) $\frac{P}{8}$ (D) $\frac{P}{16}$

17. The electric dipole moment of an electron and a proton 4.30 nm apart, is
(A) 6.88×10^{-28} C.m (B) 3.44×10^{-28} C.m
(C) 6.88×10^{-28} C/m (D) 3.44×10^{-28} C/m

18. The current density in a cylindrical wire of radius R=2.0mm is uniform across a cross section of the wire and is $J=2.0\times10^{5} A/m^{2}$. What is the current through the outer portion of the wire between radial distances R/2 and R?
(A) 2.1A (B) 1.6A (C) 1.2A (D) 1.9A

19. Which of the following unit cells has highest packing efficiency?
(A) face-centered cubic (B) body-centered cubic
(C) simple cubic (D) diamond cubic

20. What is the decay constant of a nucleus whose half-life is 2.1 min?
(A) 0.33 min^{-1} (B) 2.1 min^{-1} (C) 1.2 min^{-1} (D) 0.03 min^{-1}

21. Two resistances of 5 Ω and 20 Ω are connected in parallel. The parallel combination is connected in series with 1 Ω resistance and this series parallel combination is connected across a dc source of 100 V. The current applied by the source is
(A) 25 A (B) 20 A (C) 5A (D) 4A

22. When a circuit is suddenly switched on transient will occur if it contains elements which are
(A) Resistive and inductive number (B) Resistive and capacitive
(C) Resistive inductive and capacitive (D) Inductive and capacitive

23. Which of the following theorems helps in simplifying computations when the load across a circuit is varying
(A) Superposition (B) Norton
(C) Thevenin (D) Maximum power transfer

24. Thevenin theorem cannot be applied to network that contain elements which are
(A) Nonlinear (B) Linear (C) Active (D) Passive

25. Three resistances of 3 Ω each are connected in delta the value of the resistance is equivalent star is
(A) 27 (B) 9 (C) 1.5 (D) 1

26. In the nodal voltage method of analysis the independent variable is
(A) Branch current (B) Node voltage (C) Branch voltage (D) Mesh current

27. Two coils of N1 and N2 turns are wound a common core. If the current in coil 1 changes at 1A/Sec and it induces an EMF of one volt in coil 2, the magnitude of mutual inductances

(A) N_1/N_2 (B) N_2/N_1 (C) N_1*N_2 (D) 1 Henry

28. The dot convention is used to define the sign of

(A) Self inductance of the coils (B) Mutual inductance of the coils

(C) Direction of current flow in the coil (D) Direction of power flow

29. Root mean square value of the resultant current in the wire that carries a DC current of 20A and a sinusoidal alternating current with peak value of 20 A

(A) 24.49 (B) 28.28 (C) 23.65 (D) 25.68

30. A transformer is working at its full load and its efficiency is also maximum the iron losses 900 watts then its copper loss at $2/3^{th}$ of full load will be

(A) 250 watts (B) 300 watts (C) 400 watts (D) 600 watts

31. The average value of a full-wave rectified voltage with a peak value of 70 V is

(A) 70 V (B) 49.5 V (C) 44.5 V (D) 22.3 V

32. To bring a transistor in saturation,

(A) $I_B = I_{C\,(saturation)}$ (B) $I_B > I_{C\,(saturation)}/\beta_{DC}$

(C) $I_B < I_{C\,(saturation)}/\beta_{DC}$ (D) V_{CC} must be high

33. In a self-biased JFET, the gate is at

(A) a positive voltage (B) 0 V (C) negative voltage (D) ground

34. In an Op-amp, negative feedback

(A) increases the input and output impedances

(B) increases the input impedance and the bandwidth

(C) decreases the output impedance and the bandwidth

(D) does not affect impedances or bandwidth

35. One condition for oscillation is

(A) a phase shift around the feedback loop of 180°

(B) a gain around the feedback loop of one-third

(C) a phase shift around the feedback loop of 0°

(D) a gain around the feedback loop of less than 1

36. Number of bits required to encode the decimal numbers from 0 to 9999 in straight binary code and BCD would be, respectively

(A) 10 and 16 (B) 8 and 16 (C) 14 and 16 (D) 14 and 20

37. A 10 kHz clock signal having a duty cycle of 25% is used to clock a 3-bit binary ripple counter. What will be the frequency and duty cycle of true output of the MSB flip-flop?

(A) 1.25 kHz, 25% (B) 3.33 kHz, 25% (C) 1.25 kHz, 50% (D) 3.33 kHz, 50%

38. Power of an amplitude modulated signal depends upon

(A) Frequency of modulating signal (B) Frequency of carrier signal

(C) Modulation-index (D) Antenna height

39. The linear variable differential transformer transducer is

(A) Resistive transducer (B) Inductive transducer

(C) Capacitive transducer (D) Inductive-Capacitive Transducer

40. When you apply a triangular waveform to the input of a differentia , the output is

(A) a dc level (B) an inverted trian r waveform

(C) a square waveform (D) the first harmo f the triangular waveform

41. What will be the output of the following C code?

```
#include <stdio.h>
void main()
{
    float a = 7/22 * (3.14 + 2) * 3 / 5;
    printf("%0.2f", a);
}
```

(A) 8.28 (B) 6.28 (C) 3.1 (D) 0.00

42. What will be the output of the following C code?

```
#include <stdio.h>
void main()
{
   int y = 3;
   int x = 5 % 2 * 3 / 2;
   printf("Value of x is %d", x);
}
```

(A) Value of x is 1 (B) Value of x is 2 (C) Value of x is 3 (D) Compile time error

43. What is the precedence of arithmetic operators (from highest to lowest)?

(A) %, *, /, +, - (B) %, +, -,*, / (C) %, +, /, *, - (D) +, -, %, *, /

44. What will be the output of the following C code?

```
#include <stdio.h>
void main()
{
   int k = 8;
   int m = 7;
   int z = k < m? k = m: m++;
   printf ("%d", z);
}
```

(A) 8 (B) Depends on compile

(C) 7 (D) Run time error

45. The format identifier '%i' is also used for_____ data type.

(A) Double (B) int (C) char (D) float

46. How many times i value is checked in the following C code?

```
#include <stdio.h>
int main()
{
   int i = 0;
   do {
   i++;
   printf("in while loop\n");
   } while (i < 3);
}
```

(A) 4 (B) 2 (C) 1 (D) 3

47. What is the default return type if it is not specified in function definition?

(A) void (B) int (C) double (D) short int

48. What will be the output of the following C code?

```
#include <stdio.h>
int main()
{
   int i = 97, *p = &i;
   fun(&i);
   printf("%d", *p);
}
   void fun(int *p)
{
   int j = 2;
   p = &j;
   printf("%d\t", *p);
}
```

(A) Segmentation fault/code crash (B) 2 2

(C) Compile time error (D) 2 97

49. Wrapping data and its related functionality into a single entity is known as _____

(A) Abstraction (B) Encapsulation (C) Modularity (D) Polymorphism

50. What is meant by 'a' in the following C operation?

```
fp = fopen("Random.txt", "a");
```

(A) Attach (B) Apprehend (C) Append (D) Add

51. A frictionless heat engine can be 100 percent efficient only if its exhaust temperature is

(A) equal to its input temperature (B) less than input temperature

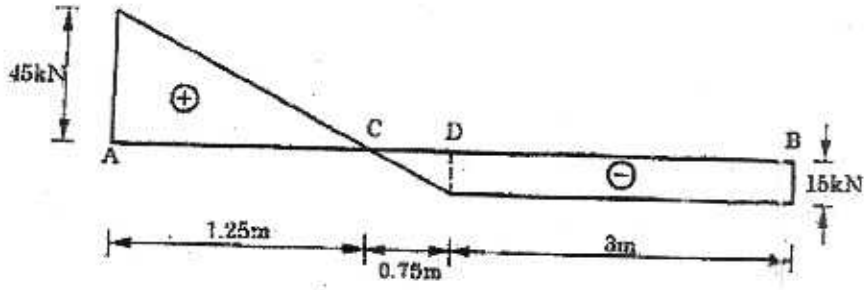
(C) 0 K (D) 0° C

52. The extension of mild steel bar 4 m long, 2000 mm^2 cross section under the action of an axial load of 20 kN, if $E = 2 \times 10^5 N/mm^2$, is

(A) 2 mm (B) 0.2 mm (C) 0.5 mm (D) 0.05 mm

53. In steady flow of fluid, the acceleration of any fluid particle is
(A) constant (B) variable (C) zero (D) never zero

54. The figure given below gives shear force diagram for a



(A) Cantilever beam (B) Simply supported beam
(C) Overhanging beam (D) insufficient data

55. While transmitting the same power by a shaft, if its speed is reduced by half, what should be its new diameter if the maximum shear stress induced in the shaft remains the same.
(A) $(2)^{1/2}$ of the original diameter (B) $(1/2)^{1/2}$ of the original diameter
(C) twice the original diameter (D) $(2)^{1/3}$ of the original diameter

56. Heating of dry and saturated steam above saturation temperature is known as
(A) Enthalpy (B) Superheating (C) Super saturation (D) Latent heat

57. Bernoulli's equation is applied to
(A) Venturimeter (B) Orifice meter (C) Pitot tube meter (D) All of these

58. At inlet to steam nozzle the enthalpy of fluid 3000 kj/kg and the velocity is 50 m/s. At the exit of the nozzle, enthalpy is 2700 kj/kg. The nozzle is kept horizontal and well insulated. The velocity at the exit of nozzle will be
(A) 912.3 m/s (B) 332.5 m/s (C) 776.2 m/s (D) 1414 m/s

59. Throttling calorimeter measures dryness fraction up to
(A) 0.68 (B) 0.98 (C) 0.56 (D) 0.76

60. For the same temperature limit, which of the following cycles has maximum efficiency,
(A) Otto Cycle (B) Carnot Cycle
(C) Normal Stirling Cycle (D) Diesel Cycle

61. The compound mainly responsible in cement for its gain of strength at a later age is
(A) C_3S (B) C_2S (C) C_3A (D) C_4AF

62. The pressure in meters of oil of specific gravity 0.8, equivalent to 80 m of water is
(A) 32 m (B) 64 m (C) 100 m (D) 150 m

63. A cantilever beam of span 2m is subjected to a uniformly distributed load of 20 kN/m all over its span. The bending moment at its support shall be
(A) 0 (B) 20 kNm (C) 40 kNm (D) 80 kNm

64. The minimum diameter of longitudinal reinforcing bar in a RCC column as per IS codal provisions is to be
(A) 8 mm (B) 12 mm (C) 16 mm (D) 20mm

65. The pitch of bolts in bolted connections of steel structures shall not be less than
(A) 2.5 d (B) 5 d (C) 10 d (D) 20 d
where 'd' is diameter of the bolt.

66. The whole circle bearing of a line is 118° 15′. Its reduced bearing shall be
(A) N 28° 15′ E (B) N 28° 15′ W (C) N 71° 45′ E (D) N 71° 45′ W

67. Reynold number of a fluid is the ratio of its
(A) inertia force to viscous force
(B) viscous force to gravity force
(C) inertia force to pressure force
(D) gravity force to inertia force

68. Superelevation in a road is provided
(A) in vertical curve portion of the road
(B) in straight portion of the road
(C) in horizontal curve portion of the road
(D) in zebra crossing portion of the road

69. A soil sample has a porosity of 40 %. The specific gravity of its solids is 2.70. Calculate its dry density. Take unit weight of water as 10 kN/m^3.
(A) 14.25 kN/m^3 (B) 29.28 kN/m^3 (C) 19.28 kN/m^3 (D) 16.19 kN/m^3

70. The concrete work in a building is estimated in terms of
(A) Length (B) Area (C) Weight (D) Volume

71. One mole of methane contains
(A) 6.023×10^{23} atoms of carbon
(B) 6.023×10^{23} atoms of hydrogen
(C) 4 gm atom of methane
(D) 24.092×10^{23} molecules of methane

72. Air is mixture of 21 mole% oxygen and 79 mol% nitrogen, its average molecular weight is
(A) 22.12 (B) 28.84 (C) 79 (D) 21

73. One kilogram per centimetre is equal to
(A) 760 torr
(B) 1 KPascal
(C) 10 meters of water column
(D) 1 meter of water column

74. Surface tension has units of
(A) N/m^3 (B) N/m^2 (C) N/m (D) Nm

75. In a reaction the threshold energy is equal to
(A) Activation energy
(B) Activation energy + normal energy of reactants
(C) Normal energy of reactants
(D) Activation energy – normal energy of reactants

76. A catalyst is a substances which
(A) Increases the equilibrium concentration of the product
(B) Changes the equilibrium constant of the reaction
(C) Short the time to reach equilibrium
(D) Supplies energy to the reaction

77. Vapour free gas means
(A) 0 % humidity
(B) 100 % humidity
(C) 1% humidity
(D) Between 0 and 100 % humidity

78. The minimum energy necessary to permit a chemical reaction is
(A) Internal energy (B) Entropy (C) Gibbs free energy (D) Threshold energy

79. Pure carbon is burnt in oxygen. The flue gas analysis is 70% CO_2, 20% CO and 10% O_2. The percent excess oxygen used is
(A) 20 (B) 12.5 (C) 0 (D) 10

80. $1m^3$ of an ideal gas at 500 K and 1000 KPa expands reversibly to 5 times its initial volume in an insulated container. If the specific heat capacity (at constant pressure) of the gas is 21 J/mol K, the final temperature will be
(A) 35 K (B) 174 K (C) 274 K (D) 154 K

81. Which of the following green house gases is entirely anthropogenic in nature?
(A) Carbondioxide
(B) Chlorofluorocarbons
(C) Methane
(D) Water vapors

82. Which of the following is not one of the major environmental problems resulting from human interference in the nitrogen cycle?
(A) Eutrophication
(B) Acid rain
(C) Global warming due to release of nitrous oxide
(D) Ozone depletion

83. Temporary hardness of water is due to
(A) $MgSO_4$ (B) $Ca(HCO_3)_2$ (C) $CaNO_3$ (D) Na_2SO_4

84. Which of the following dissolved salts in water will cause the most hardness in water sample?
(A) 10 ppm of $CaSO_4$
(B) 10 ppm of $CaCO_3$
(C) 10 ppm of $MgCl_2$
(D)10 ppm of $Mg(OH)_2$

85. Caustic embrittlement is a particular case of
(A) Wet corrosion (B) Stress corrosion (C) Dry corrosion (D) Pitting corrosion

86. Corrosion of zinc metal containing an impurity of copper is called
(A) Waterline corrosion
(B) Moist corrosion
(C) Galvanic corrosion
(D) Stress corrosion

87. Which of the following metals is more corrosion resistant than expected from their position in the electrochemical series?
(A) Magnesium (B) Cobalt (C) Aluminium (D) Iron

88. Calorific value of a sample of coal is high if
(A) fixed carbon is high
(B) moisture content is high
(C) ash content is high
(D) volatile matter is high

89. What is the total number of orbitals associated with the principal quantum number n = 3 ?
(A) 18 (B) 9 (C) 7 (D) 14

90. Which of the following has highest first ionization potential?
(A) Carbon (B) Oxygen (C) Nitrogen (D) Boron

91. Determine the relationship between the words CONVOCATION : MEETING and then select from the following pair of words which have a similar relationship.
(A) Bargain : Market
(B) Supplication : Prayer
(C) Issue : Referendum
(D) Speech : Podium

92. Complete the sentence: Some are born with a _____ to commit suicide, whereas some commit suicide because they are unable to bear _____ changes in their lives.
(A) sentiment . . inimical (B) resolution . . adverse
(C) predisposition . . cataclysmic (D) prodigy . . abrupt

93. Choose the alternative to idiom in bold letters:
He likes to **beat about the bush**. He does it all the time.
(A) likes to talk about what is important.
(B) is good at everything he does.
(C) is brief and to the point.
(D) avoids talking about what is important.

94. Identify the adverb from the following:
(A) Anxious (B) Authority (C) Well (D) Sensed

95. As soon as he _____ the old chair in the room it _____ again.
(A) repair, break (B) had repaired, broke
(C) repaired, break (D) repaired, broke

96. If + means ÷, × means -, ÷ means × and – means +, than $18 + 6 \times 4 \div 6 - 8 =$?
(A) 13 (B) -13 (C) 14 (D) -14

97. Five brothers, Rohan, Rahil, Ryan, Raghav and Rahi, are all busy in a room on a winter afternoon. Rahul is cooking, Rahil is playing chess, Ryan is washing clothes, and Raghav is studying. What is Rahi doing?
(A) cooking (B) playing chess (C) washing clothes (D) studying

98. Statement: 'A' company has incurred accumulated losses of Rs.200 crore since it was launched in 2000.
Courses of Action:
I: 'A' company should increase ticket fares and reduce the expenditure on unnecessary waste.
II: 'A' company should raise loan of Rs 300 crore to make it economically operational.
(A) Only I follow (B) Only II follows
(C) Neither I nor II follows (D) Both I and II follow

99. He said that his brother was going to Canada.
(A) He said, "His brother is going to Canada."
(B) He told, "His brother is going to Canada."
(C) He said, "My brother is going to Canada."
(D) He said, "My brother was going to Canada."

100. He enclosed
P : and the postage
Q : a postal order
R : the price of books
S : which will cover
The Proper sequence should be:
(A) RPSQ (B) QSPR (C) QSRP (D) QPSR

x-x-x