CUET UG 2025 Mathematics May 14 Shift 1 Question Paper

Conducted by the National Testing Agency (NTA)

Time Allowed: 60 Minutes **Total Questions: 85** **Maximum Marks: 250**

General Instructions

(i) This is the **Mathematics** question paper of **CUET (UG) 2025**, conducted by the **National Testing Agency (NTA)** in Computer Based Test (CBT) mode.

(ii) The paper contains **85 multiple choice questions**. Section A contains 15 compulsory questions. Choose either Section B1 or Section B2. Attempt all 35 questions in the chosen section.

(iii) The duration of this test paper is **60 minutes**. The maximum score is **250 marks**.

(iv) Each question has **four options**. Select the **one correct answer** for each question.

(v) **Marking scheme: +5 marks** for a correct answer, **-1 mark** for an incorrect answer, and **0 marks** for an unanswered question.

(vi) For questions based on a passage or table, read the given material carefully and answer the questions that follow.

Section A - Common

1. Let A $= [a_{ij}]_{n\times n}$ be a matrix. Then
Match List-I with List-II

List-I	List-II
(A) $A^T = A$	(I) A is a singular matrix
(B) $A^T = -A$	(II) A is a non-singular matrix
(C) $\|A\| = 0$	(III) A is a skew symmetric matrix
(D) $\|A\| \neq 0$	(IV) A is a symmetric matrix

Choose the correct answer from the options given below:

(A) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

(B) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

(C) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

(D) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

2. If $A = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ then the matrix AB is equal to

(A) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

(B) $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$

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

(D) $\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$

3. If A is a square matrix and I is the identity matrix of same order such that $A^2 = I$, then $(A - I)^3 + (A + I)^3 - 3A$ is equal to

(A) A

(B) 2A

(C) 3A

(D) 5A

4. If $A = \begin{bmatrix} 0 & 0 & \sqrt{3} \\ 0 & \sqrt{3} & 0 \\ \sqrt{3} & 0 & 0 \end{bmatrix}$, then $|adj\ A|$ is equal to

(A) 3

(B) 9

(C) 27

(D) 81

5. If $y = 3e^{2x} + 2e^{3x}$, then $\frac{d^2y}{dx^2} + 6y$ is equal to

(A) $\frac{dy}{dx}$

(B) $5\frac{dy}{dx}$

(C) $6\frac{dy}{dx}$

(D) $30\frac{dy}{dx}$

6. The interval, on which the function $f(x) = x^2e^{-x}$ is increasing, is equal to

(A) $(-\infty, \infty)$

(B) $(-\infty, 2) \cup (2, \infty)$

(C) $(-2, 0)$

(D) $(0, 2)$

7. If the maximum value of the function $f(x) = \frac{\log_e x}{x}, x > 0$ occurs at $x = a$, then $a^2f''(a)$ is equal to

(A) $-\frac{5}{e}$

(B) $-\frac{1}{e}$

(C) $-\frac{1}{e^3}$

(D) $-5e^3$

8. $\int_1^4 |x-2|\,dx$ is equal to

(A) 5 (B) $\frac{7}{2}$

(C) $\frac{3}{2}$ (D) $\frac{5}{2}$

9. The integral $I = \int \frac{e^{5\log_e x} - e^{4\log_e x}}{e^{3\log_e x} - e^{2\log_e x}}\,dx$ is equal to

(A) $\frac{x}{2} + C$, where C is the constant of integration

(B) $\frac{x^2}{2} + C$, where C is the constant of integration

(C) $\frac{x^3}{3} + C$, where C is the constant of integration

(D) $\frac{x^4}{4} + C$, where C is the constant of integration

10. The area (in sq. units) of the region bounded by the parabola $y^2 = 4x$ and the line $x = 1$ is

(A) $\frac{1}{3}$ (B) $\frac{4}{3}$

(C) $\frac{5}{3}$ (D) $\frac{8}{3}$

11. Which of the following are linear first order differential equations?

(A) $\frac{dy}{dx} + P(x)y = Q(x)$

(B) $\frac{dx}{dy} + P(y)x = Q(y)$

(C) $(x-y)\frac{dy}{dx} = x + 2y$

(D) $(1+x^2)\frac{dy}{dx} + 2xy = 2$

Choose the correct answer from the options given below:

(A) (A), (B) and (D) only (B) (A) and (B) only

(C) (A), (B) and (C) only (D) (A), (B), (C) and (D)

12. The solution of the differential equation $\log_e\left(\frac{dy}{dx}\right) = 3x + 4y$ is given by

(A) $4e^{3x} + 3e^{-4y} + C = 0$, where C is constant of integration

(B) $3e^{3x} + 4e^{-4y} + C = 0$, where C is constant of integration

(C) $4e^{-3x} + 3e^{4y} + C = 0$, where C is constant of integration

(D) $3e^{-3x} + 4e^{4y} + C = 0$, where C is constant of integration

13. The probability distribution of a random variable X is given by

X	0	1	2
P(X)	$1 - 7a^2$	$\frac{1}{2}a + \frac{1}{4}$	a^2

If $a > 0$, then $P(0 < x \leq 2)$ is equal to

(A) $\frac{1}{16}$ (B) $\frac{3}{18}$

(C) $\frac{7}{16}$ (D) $\frac{9}{16}$

14. The corner points of the feasible region associated with the LPP: Maximise $Z = px + qy, p, q > 0$ subject to $2x + y \leq 10, x + 3y \leq 15, x, y \geq 0$ are (0, 0), (5, 0), (3, 4) and (0, 5). If optimum value occurs at both (3, 4) and (0, 5), then

(A) $p = q$ (B) $p = 2q$

(C) $p = 3q$ (D) $q = 3p$

15. Consider the LPP: Minimize $Z = x + 2y$ subject to $2x + y \geq 3, x + 2y \geq 6, x, y \geq 0$. The optimal feasible solution occurs at

(A) (6, 0) only (B) (0, 3) only

(C) Neither (6, 0) nor (0, 3) (D) Both (6, 0) and (0, 3)

16. Let $f : R \to R$ be defined as $f(x) = 10x$. Then (Where R is the set of real numbers)

(A) f is both one-one and onto
(B) f is onto but not one-one
(C) f is one-one but not onto
(D) f is neither one-one nor onto

17. Let $A = \{1, 2, 3\}$. Then, the number of relations containing (1, 2) and (1, 3), which are reflexive and symmetric but not transitive, is

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

18. for $|x| < 1$, $\sin(\tan^{-1} x)$ equal to

(A) $\frac{1}{\sqrt{1+x^2}}$
(B) $\frac{1}{\sqrt{1-x^2}}$
(C) $\frac{x}{\sqrt{1-x^2}}$
(D) $\frac{x}{\sqrt{1+x^2}}$

19. Let $A = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 3 & 2 \\ 2 & 4 & 1 \end{bmatrix}$ and M_{ij}, A_{ij} respectively denote the minor, co-factor of an element a_{ij} of matrix A, then which of the following are true?
(A) $M_{22} = -1$
(B) $A_{23} = 0$
(C) $A_{32} = 3$
(D) $M_{23} = 1$
(E) $M_{32} = -3$
Choose the correct answer from the options given below:

(A) (A) and (B) only
(B) (A), (B), (C) and (E) only
(C) (A), (D) and (E) only
(D) (A), (C) and (E) only

20. Let $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$. If $A^T + A = I$, then

(A) $\theta = 2n\pi + \frac{\pi}{3}, n \in Z$
(B) $\theta = n\pi, n \in Z$
(C) $\theta = (2n+1)\frac{\pi}{2}, n \in Z$
(D) $\theta = 2n\pi + \frac{\pi}{6}, n \in Z$

21. If A and B are skew-symmetric matrices, then which one of the following is NOT true?

(A) $A^3 + B^5$ is skew-symmetric
(B) A^{19} is skew-symmetric
(C) B^{14} is symmetric
(D) $A^4 + B^5$ is symmetric

22. If A and B are invertible matrices then which of the following statement is NOT correct?

(A) $adj\ A = |A|A^{-1}$
(B) $(A+B)^{-1} = A^{-1} + B^{-1}$
(C) $|A^{-1}| = |A|^{-1}$
(D) $(AB)^{-1} = B^{-1}A^{-1}$

23. Let $A = [a_{ij}]_{2\times 3}$ and $B = [b_{ij}]_{3\times 2}$, then $|5AB|$ is equal to

(A) $5^2.|A|.|B|$
(B) $5^3.|A|.|B|$
(C) $5^2|AB|$
(D) $5^3|AB|$

24. Let AX = B be a system of three linear equations in three variables. Then the system has
(A) a unique solutions if $|A| = 0$
(B) a unique solutions if $|A| \neq 0$
(C) no solutions if $|A| = 0$ and $(adj\ A)B \neq O$
(D) infinitely many solutions if $|A| = 0$ and $(adj\ A)B = O$
Choose the correct answer from the options given below:

(A) (A), (C) and (D) only
(B) (B), (C) and (D) only
(C) (B) only
(D) (B) and (C) only

25. If the function $f(x) = \begin{cases} \frac{k\cos x}{\pi - 2x} & : x \neq \frac{\pi}{2} \\ 3 & : x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$, then k is equal to

(A) 6
(B) 5
(C) -6
(D) 4

26. Match List-I with List-II

List-I	List-II
(A) $f(x) = \|x\|$	(I) Not differentiable at $x = -2$ only
(B) $f(x) = \|x + 2\|$	(II) Not differentiable at $x = 0$ only
(C) $f(x) = \|x^2 - 4\|$	(III) Not differentiable at $x = 2$ only
(D) $f(x) = \|x - 2\|$	(IV) Not differentiable at $x = 2, -2$ only

Choose the correct answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

(B) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

(C) (A) - (II), (B) - (I), (C) - (III), (D) - (IV)

(D) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

27. Let $y = \sin(\cos x^2)$, then the value of $\frac{dy}{dx}$ at $x = \frac{\sqrt{\pi}}{2}$ is equal to

(A) $\frac{-\sqrt{\pi}}{2}\cos\left(\frac{1}{\sqrt{2}}\right)$

(B) $-\sqrt{\frac{\pi}{2}}\cos\left(\frac{1}{\sqrt{2}}\right)$

(C) $-\sqrt{\frac{\pi}{2}}\sin\left(\frac{1}{\sqrt{2}}\right)$

(D) $\sqrt{\frac{\pi}{2}}\sin\left(\frac{1}{\sqrt{2}}\right)$

28. Match List-I with List-II

List-I	List-II
(A) The minimum value of $f(x) = (2x - 1)^2 + 3$	(I) 4
(B) The maximum value of $f(x) = -\|x + 1\| + 4$	(II) 10
(C) The minimum value of $f(x) = \sin(2x) + 6$	(III) 3
(D) The maximum value of $f(x) = -(x - 1)^2 + 10$	(IV) 5

Choose the correct answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

(B) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

(C) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

29. The function $f(x) = \tan x - x$

(A) is a decreasing function on $\left[0, \frac{\pi}{2}\right)$

(B) is an increasing function on $\left[0, \frac{\pi}{2}\right)$

(C) is a constant function

(D) is neither increasing nor decreasing function on $\left[0, \frac{\pi}{2}\right)$

30. The rate of change of area of a circle with respect to its circumference when radius is 4cm, is

(A) $2\ cm^2/cm$

(B) $4\ cm^2/cm$

(C) $8\ cm^2/cm$

(D) $16\ cm^2/cm$

31. $\int_{\pi/6}^{\pi/3} \frac{\tan x}{\tan x + \cot x}\, dx$ is equal to

(A) $\frac{\pi}{4}$

(B) 0

(C) $\frac{\pi}{6}$

(D) $\frac{\pi}{12}$

32. Match List-I with List-II.

List-I (Definite integral)	List-II (Value)
(A) $\int_0^1 \frac{2x}{1+x^2}\, dx$	(I) 2
(B) $\int_{-1}^1 \sin^3 x \cos^4 x\, dx$	(II) $\log_e\left(\frac{3}{2}\right)$
(C) $\int_0^{\pi} \sin x\, dx$	(III) $\log_e 2$
(D) $\int_2^3 \frac{2}{x^2-1}\, dx$	(IV) 0

Choose the correct answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

(B) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

(C) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

33. The integral $I = \int e^x \left(\frac{x-1}{3x^2}\right) dx$ is equal to

(A) $\frac{1}{3}\left(\frac{x^2}{2} - x\right) + C$, where C is constant of integration

(B) $\left(\frac{x^2}{2} - x\right) e^x + C$, where C is constant of integration

(C) $\frac{1}{3x^2}e^x + C$, where C is constant of integration

(D) $\frac{1}{3x}e^x + C$, where C is constant of integration

34. The area (in sq. units) of the region bounded by the curve $y = x^5$, the x-axis and the ordinates $x = -1$ and $x = 1$ is equal to

(A) $\frac{1}{6}$ (B) $\frac{1}{3}$

(C) $\frac{1}{2}$ (D) $\frac{2}{3}$

35. The area (in sq. units) of the region bounded by $y = 2\sqrt{1-x^2}, x \in [0,1]$ and x-axis is equal to

(A) 1 (B) 2

(C) $\frac{\pi}{2}$ (D) $\frac{\pi}{4}$

36. The integrating factor of the differential equation $(x \log_e x)\frac{dy}{dx} + y = 2\log_e x$ is

(A) $\log_e x$ (B) x

(C) $\frac{1}{x}$ (D) $\frac{1}{\log_e x}$

37. Consider the differential equation, $x\frac{dy}{dx} = y(\log_e y - \log_e x + 1)$, then which of the following are true?

(A) It is a linear differential equation

(B) It is a homogenous differential equation

(C) Its general solution is $\log_e\left(\frac{y}{x}\right) = Cx$, where C is constant of integration

(D) Its general solution is $\log_e\left(\frac{x}{y}\right) = Cy$, where C is constant of integration

(E) If $y(1) = 1$, then its particular solution is $y = x$

Choose the correct answer from the options given below:

(A) (A), (D) and (E) only (B) (A) and (D) only

(C) (B) and (C) only (D) (B), (C) and (E) only

38. If $\hat{i}, \hat{j}$ and $\hat{k}$, are unit vectors along co-ordinates axes OX, OY and OZ respectively, then which of the following is/are true?

(A) $\hat{i} \times \hat{i} = \vec{0}$

(B) $\hat{i} \times \hat{k} = \hat{j}$

(C) $\hat{i} \cdot \hat{i} = 1$

(D) $\hat{i} \cdot \hat{j} = 0$

Choose the correct answer from the options given below:

(A) (A) and (B) only (B) (A), (C) and (D) only

(C) (A) only (D) (A), (B), (C) and (D)

39. If the points A, B, C with position vectors $20\hat{i} + \lambda\hat{j}, 5\hat{i} - \hat{j}$ and $10\hat{i} - 13\hat{j}$ respectively are collinear, then the value of λ is

(A) 12 (B) -37

(C) 37 (D) -12

40. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ and $|\vec{a}| = 3, |\vec{b}| = 5, |\vec{c}| = 7$, then the angle between $\vec{a}$ and $\vec{b}$ is

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$

(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{6}$

41. Let $\vec{a} = \hat{i} + 4\hat{j}, \vec{b} = 4\hat{j} + \hat{k}$ and $\vec{c} = \hat{i} - 2\hat{k}$. If $\vec{d}$ is a vector perpendicular to both $\vec{a}$ and $\vec{b}$ such that $\vec{c}.\vec{d} = 16$, then $|\vec{d}|$ is equal to

(A) $\sqrt{33}$ (B) $2\sqrt{33}$

(C) $3\sqrt{33}$ (D) $4\sqrt{33}$

42. If a line makes angles α, β, γ with the positive directions of x-axis, y-axis and z-axis respectively, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is equal to

(A) 1 (B) 2

(C) 3 (D) -2

43. Consider the line $\vec{r} = \hat{i} - 2\hat{j} + 4\hat{k} + \lambda(-\hat{i} + 2\hat{j} - 4\hat{k})$

Match List-I with List-II

List-I	List-II
(A) A point on the given line	(I) $\left(\frac{-1}{\sqrt{21}}, \frac{2}{\sqrt{21}}, \frac{-4}{\sqrt{21}}\right)$
(B) direction ratios of the line	(II) $(4, -2, -2)$
(C) direction cosines of the line	(III) $(1, -2, 4)$
(D) direction ratios of a line perpendicular to given line	(IV) $(-1, 2, -4)$

Choose the correct answer from the options given below:

(A) (A) - (IV), (B) - (III), (C) - (II), (D) - (I) (B) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

(C) (A) - (III), (B) - (IV), (C) - (I), (D) - (II) (D) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

44. The shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{4}=\frac{y-4}{6}=\frac{z-5}{8}$ is equal to

(A) 0

(B) $\sqrt{\frac{29}{5}}$

(C) $\sqrt{\frac{5}{29}}$

(D) $\sqrt{5}$

45. Which one of the following set of constraints does the given shaded region represent?
The figure shows the first quadrant bounded by two parallel lines of slope -1: the outer line joins (30, 0) on the x-axis to (0, 30) on the y-axis, and the inner line joins (15, 0) on the x-axis to (0, 15) on the y-axis. A vertical line x = 15 and a horizontal line y = 20 are also drawn, intersecting at the marked point (15, 20). The shaded region lies between the two parallel diagonal lines, bounded on the right by x = 15 and on top by y = 20, within the first quadrant.

(A) $x+y\leq 30, x+y\geq 15, x\leq 15, y\leq 20, x, y\geq 0$

(B) $x+y\leq 30, x+y\geq 15, y\leq 15, x\leq 20, x, y\geq 0$

(C) $x+y\geq 30, x+y\leq 15, x\leq 15, y\leq 20, x, y\geq 0$

(D) $x+y\geq 30, x+y\leq 15, y\leq 15, x\leq 20, x, y\geq 0$

46. The corner points of the feasible region of the LPP: Minimize $Z=-50x+20y$ subject to $2x-y\geq -5, 3x+y\geq 3, 2x-3y\leq 12$ and $x, y\geq 0$ are

(A) $(0,5),(0,6),(1,0),(6,0)$

(B) $(0,3),(0,5),(3,0),(6,0)$

(C) $(0,3),(0,5),(1,0),(6,0)$

(D) $(0,5),(0,6),(1,0),(3,0)$

47. If A and B are any two events such that P(B) = P(A and B), then which of the following is correct

(A) $P(B|A)=1$

(B) $P(A|B)=1$

(C) $P(B|A)=0$

(D) $P(A|B)=0$

48. If A is any event associated with sample space and If E_1, E_2, E_3 are mutually exclusive and exhaustive events. Then which of the following are true?

(A)

$P(A)=P(E_1)P(E_1|A)+P(E_2)P(E_2|A)+P(E_3)P(E_3|A)$

(B)

$P(A)=P(A|E_1)P(E_1)+P(A|E_2)P(E_2)+P(A|E_3)P(E_3)$

(C) $P(E_i|A)=\frac{P(A|E_i)P(E_i)}{\sum_{i=1}^{3}P(A|E_i)P(E_i)}, i=1,2,3$

(D) $P(A|E_i)=\frac{P(E_i|A)P(E_i)}{\sum_{i=1}^{3}P(E_i|A)P(E_i)}, i=1,2,3$

Choose the correct answer from the options given below:

(A) (A) and (C) only

(B) (A) and (D) only

(C) (B) and (D) only

(D) (B) and (C) only

49. Match List-I with List-II
Let A and B are two events such that $P(A)=0.8, P(B)=0.5, P(B|A)=0.4$

List-I	List-II
(A) $P(A\cap B)$	(I) 0.2
(B) $P(A\|B)$	(II) 0.32
(C) $P(A\cup B)$	(III) 0.64
(D) $P(A')$	(IV) 0.98

Choose the correct answer from the options given below:

(A) (A) - (II), (B) - (IV), (C) - (III), (D) - (I)

(B) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

(C) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

(D) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

50. A black and a red die are rolled simultaneously. The probability of obtaining a sum greater than 9, given that the black resulted in a 5 is

(A) 1/2

(B) 1

(C) 2/3

(D) 1/3

51. If P, Q and R are three singular matrices given by $P = \begin{bmatrix} 2 & 3a \\ 4 & 3 \end{bmatrix}$, $Q = \begin{bmatrix} b & 5 \\ 2a & 6 \end{bmatrix}$ and $R = \begin{bmatrix} a^2+b^2-c & 1-c \\ c+1 & c \end{bmatrix}$, then the value of $(2a + 6b + 17c)$ is

(A) 30 (B) 18

(C) 34 (D) 24

52. Let A be a non-singular matrix of order 3 and $|A| = 15$, then $|adj\ A|$ is equal to

(A) 15 (B) 45

(C) 225 (D) 150

53. If $A = \begin{bmatrix} 3 & 7 \\ 4 & -2 \end{bmatrix}$, $X = \begin{bmatrix} \alpha \\ -2 \end{bmatrix}$, $B = \begin{bmatrix} 7 \\ 32 \end{bmatrix}$ and $AX = B$, then the value of the α is

(A) 7 (B) 4/3

(C) 1 (D) 5

54. Which of the following statements is incorrect?

(A) If two rows or two columns of a determinant are identical, then the value of the determinant is zero.

(B) If all the elements in any one row of the determinant are zero, then the determinant value is zero.

(C) The value of the determinant remains unchanged if its rows and columns are interchanged.

(D) If any two rows of a determinant are interchanged, then the sign of the determinant remains unchanged.

55. Match List-I with List-II

List-I (Matrix)	List-II (Inverse of the Matrix)
(A) $\begin{bmatrix} 1 & 7 \\ 4 & -2 \end{bmatrix}$	(I) $\begin{bmatrix} 2/15 & 1/10 \\ -1/15 & 1/5 \end{bmatrix}$
(B) $\begin{bmatrix} 6 & -3 \\ 2 & 4 \end{bmatrix}$	(II) $\begin{bmatrix} 1/5 & -2/15 \\ -1/10 & 7/30 \end{bmatrix}$
(C) $\begin{bmatrix} 5 & 2 \\ -5 & 4 \end{bmatrix}$	(III) $\begin{bmatrix} 1/15 & 7/30 \\ 2/15 & -1/30 \end{bmatrix}$
(D) $\begin{bmatrix} 7 & 4 \\ 3 & 6 \end{bmatrix}$	(IV) $\begin{bmatrix} 2/15 & -1/15 \\ 1/6 & 1/6 \end{bmatrix}$

Choose the correct answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

(B) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)

(C) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

(D) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

56. If X = 11 and Y = 3, then $X \bmod Y = (X + aY) \bmod Y$ holds

(A) Only for even integral values of a

(B) Only for odd integral values of a

(C) for all integral values of a

(D) for $a = 0$ only

57. The least non-negative remainder when 3^{128} is divided by 7 is:

(A) 2 (B) 3

(C) 4 (D) 5

58. A tub contains 60 litres of milk. From this tub, 6 litres of milk was taken out and replaced with water. This whole process was repeated further two more times. How much milk is there in the tub now?

(A) 29.16 litre (B) 43.74 litre

(C) 42.24 litre (D) 38.74 litre

59. A person can row a boat in still water at the rate of 5 km/hr. It takes him 4 times as long to row upstream of a river as to row downstream to cover same distance in the same river. The speed of flow of the stream is

(A) 5 km/hr (B) 3 km/hr

(C) 6.5 km/hr (D) 4 km/hr

60. Two runners, Ajay and Vijay complete a 600 m race in 38 seconds and 48 seconds respectively. By how many meters will Ajay defeat Vijay?

(A) 120 m (B) 140 m

(C) 125 m (D) 50 m

61. Which of the following inequalities holds true?

(A) $\sqrt{5}+\sqrt{3}>\sqrt{6}+\sqrt{2}$

(B) If $a>b$ and $c<0$, then $\frac{a}{c}<\frac{b}{c}$.

(C) $\frac{1}{x^2}>\frac{1}{x}>1$, if $0<x<1$.

(D) If a and b are positive integers and $\frac{a-b}{6.25}=\frac{4}{2.5}$, then $b>a$.

Choose the correct answer from the options given below:

(A) (A), (B) and (D) only (B) (A), (B) and (C) only

(C) (A) and (B) only (D) (B) and (C) only

62. If $e^y=\log x$, then which of the following is true?

(A) $x\frac{d^2y}{dx^2}-\left(\frac{dy}{dx}\right)^2+\frac{dy}{dx}=0$

(B) $\frac{d^2y}{dx^2}-x\frac{dy}{dx}=0$

(C) $\frac{d^2y}{dx^2}-\left(\frac{dy}{dx}\right)^2+1=0$

(D) $x\frac{d^2y}{dx^2}+x\left(\frac{dy}{dx}\right)^2+\frac{dy}{dx}=0$

63. The total cost $C(x)$ in Rupees associated with the production of x units of an item is given by $C(x)=0.007x^3+26x^2+15x+400$. The marginal cost when 10 items are produced is:

(A) ₹ 537.1 (B) ₹ 441.15

(C) ₹ 1575 (D) ₹ 875.25

64. The slope of the normal to the curve $y=2x^2$ at $x=1$ is:

(A) 4 (B) -4

(C) 1/2 (D) -1/4

65. If $\int\frac{(1+x\log x)}{xe^{-x}}dx=e^xf(x)+C$, where C is constant of integration, then $f(x)$ is

(A) e^x (B) $\log x$

(C) $\frac{1}{x}$ (D) $\frac{1}{x^2}$

66. Let $e^{\alpha y}+e^{\beta y}+\gamma x^2+\delta\log|x|+C=0$, where $C\in\mathbb{R}$, be a particular solution of the differential equation $x(e^{2y}-1)dy+(x^2-1)e^ydx=0$ and passes through the point $(1,1)$. The value of $(\alpha+\beta+\gamma+\delta-C)$ is

(A) $e-1$ (B) e^2-1

(C) $e+\frac{1}{e}$ (D) $\frac{1}{e}$

67. The probability distribution of the random variable X is given by

X	0	1	2	3
P(X)	0.2	k	2k	2k

The variance of the random variable X is

(A) $\frac{764}{625}$ (B) $\frac{1}{625}$

(C) 1 (D) $\frac{108}{25}$

68. How many minimum number of times must a man toss a fair coin so that the probability of having at least one head is more than 90%?

(A) 3 (B) 4

(C) 5 (D) 10

69. Let $F(Z)$ be the cumulative density function of the standard normal variate Z, then which of the following are correct?

(A) $F(Z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Z} e^{-\frac{z^2}{2}} dz, \ -\infty < Z < \infty$

(B) $F(-Z) = 1 - F(Z)$

(C) $F(0) = 0$

(D) $F(\infty) = 1$

Choose the correct answer from the options given below:

(A) (A), (B) and (D) only (B) (A), (B) and (C) only

(C) (A), (C) and (D) only (D) (B) and (D) only

70. What is the mean of the numbers obtained on throwing a die having written 1 on three faces, 2 on two faces and 5 on 1 face?

(A) 2 (B) 4

(C) 1 (D) 8

71. For the given 5 values, 15, 18, 21, 27, 39; the three year moving averages are:

(A) 18, 21, 29 (B) 18, 22, 29

(C) 18, 23, 37 (D) 18, 20, 28

72. Which of the following are correct?

(A) Time series analysis does not help to understand the behavior of a variable in the past.

(B) Time series predict the future behavior of variable.

(C) Time series helps to plan future operations.

(D) The main aim of the time series analysis is to derive conclusions after arranging the time series in a systematic manner.

Choose the correct answer from the options given below:

(A) (A), (B) and (D) only (B) (A), (B) and (C) only

(C) (B), (C) and (D) only (D) (C) and (D) only

73. Which of the following is not a component of the time series?

(A) Trend component (B) Cyclical Component

(C) Seasonal Component (D) Average Component

74. If $y = a + b(x - 2022)$ is a straight line trend using the least square method for the following data

Year (x)	2020	2021	2022	2023	2024
Profit (Rs. '000) (y)	2	3	4	5	2

Then the value of $\frac{a}{b}$ is :

(A) 15 (B) 5

(C) 16 (D) 2/3

75. Match List-I with List-II

List-I	List-II
(A) An observed set of population selected for analysis	(I) Parameter
(B) A specific characteristic of the population	(II) Hypothesis
(C) A specific characteristic of the sample	(III) Statistic
(D) A statement made about a population parameter for testing	(IV) Sample

Choose the correct answer from the options given below:

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

(B) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

(C) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

(D) (A) - (IV), (B) - (I), (C) - (III), (D) - (II)

76. Which of the following are the assumptions underlying the use of t-distribution?
(A) The variance of population is known.
(B) The samples are drawn from a normally distributed population.
(C) Sample standard deviation is an unbiased estimate of the population variance.
(D) It depends on a parameter known as degree of freedom.
Choose the correct answer from the options given below:

(A) (A), (B) and (D) only

(B) (A), (B) and (C) only

(C) (B) and (D) only

(D) (C) and (D) only

77. If a 95% confidence interval for a population mean was reported to be 132 to 160 and sample standard deviation $\sigma = 50$, then the size of the sample in the study is:
(Given $Z_{0.025} = 1.96$)

(A) 90

(B) 95

(C) 50

(D) 49

78. An annuity in which the periodic payment begin on a fixed date and continue forever is called

(A) Sinking Fund

(B) Perpetuity

(C) Coupon payment

(D) Bond

79. Which of the following are correct about the Sinking Fund?
(A) It is a fixed term account.
(B) It is a set-up for a particular upcoming expense.
(C) A fixed amount at regular intervals is deposited in the Sinking Fund.
(D) It can be used in any emergency.
Choose the correct answer from the options given below:

(A) (A), (B) and (D) only

(B) (A), (B) and (C) only

(C) (C) and (D) only

(D) (B), (C) and (D) only

80. A person wishes to purchase a house for ₹ 39,65,000 with a down payment of ₹ 5,00,000 and balance in equal monthly installments (EMI) for 25 years. If bank charges 6% per annum compounded monthly, then EMI on reducing balance payment method is:
$[Given (1.005)^{300} = 4.465]$

(A) ₹ 22325
(B) ₹ 36542
(C) ₹ 21652
(D) ₹ 34500

81. The original value of an asset minus the accumulated depreciation at a given date is known as

(A) Salvage value
(B) Book value
(C) Scrap value
(D) Lost Value

82. A sofa set costing ₹ 36000 has a useful life of 10 years. If the annual depreciation is ₹ 3000, then the scrap value by linear method is:

(A) ₹ 4000
(B) ₹ 6000
(C) ₹ 4200
(D) ₹ 5400

83. A person invested ₹ 10000 in a stock of a company for 6 years. The value of his investment at the end of each year is given in the following table:

2018	2019	2020	2021	2022	2023
₹ 11000	₹ 11500	₹ 13000	₹ 11800	₹ 12200	₹ 14000

The compound annual growth rate (CAGR) of his investment is:
$[Given\ (1.4)^{1/6} = 1.058]$

(A) 5.8%
(B) 4.2%
(C) 6.8%
(D) 3.2%

84. Which of the following is NOT a basic requirement of the linear programming problem (LPP)?

(A) All the elements of an LPP should be quantifiable.
(B) All decision variables should assume non-negative values.
(C) There are a finite number of decision variables and a finite number of constraints.
(D) It deals with optimizing number of objectives more than one.

85. Which of the following statements are correct in reference to the linear programming problem(LPP):
$Maximize\ Z = 5x + 2y$
subject to the following constraints
$3x + 5y \leq 15, \quad 5x + 2y \leq 10, \quad x \geq 0, y \geq 0.$
(A) The LPP has a unique optimal solution at (2, 0) only.
(B) The feasible region is bounded with corner points (0, 0), (2, 0), (20/19, 45/19) and (0, 3).
(C) The optimal value is unique, but there are an infinite number of optimal solutions.
(D) The feasible region is unbounded.
Choose the correct answer from the options given below:

(A) (A) and (D) only
(B) (A), (B) and (C) only
(C) (A), (C) and (D) only
(D) (B) and (C) only

- End of Question Paper -