

General Instructions

- (i) This question paper contains 85 questions: Section A (15 questions, common to all candidates), Section B1 Mathematics (35 questions) and Section B2 Applied Mathematics (35 questions).
- (ii) Candidates attempt Section A and any one of Section B1 or Section B2, that is 50 questions in all. Every question is a single-correct multiple-choice question.
- (iii) These questions follow the CUET (UG) examination pattern.
- (iv) Each correct answer is awarded +5 marks, with -1 for an incorrect answer.
- (v) The time allotted for this paper is 60 minutes.
- (vi) Attempt every question; detailed solutions are provided in the companion solutions booklet.

1. A is any matrix, defined by $A = [a_{ij}]_{3 \times 3}$, where $a_{ij} = |i - j|$, then which of the following statements are true ?

- A. A is symmetric matrix.
- B. A is skew-symmetric matrix.
- C. A is diagonal matrix.
- D. A is non singular matrix.

Choose the **correct** answer from the options given below:

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

2. If $AB = A$ and $BA = B$, where A and B are square matrices of same order, then

- (A) $B^2 = B, A^2 = A$
- (B) $B^2 \neq B$ and $A^2 = A$
- (C) $A^2 \neq A, B^2 = B$
- (D) $A^2 \neq A, B^2 \neq B$



3. If $\Delta = \begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = (1 + ax^3)^b$, then which of the following statements are TRUE?

- A. $a = -1$ and $b = 2$
- B. $x = 1$ is a multiple root of $\Delta = 0$
- C. $x = 1$ is a simple root of $\Delta = 0$
- D. $x = 3$ is a simple root of $\Delta = 0$

Choose the **correct** answer from the options given below:

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



4. If A is a square matrix of order 3×3 , and $|\text{adj } A| = 25$, then the value of $|2A|$ is

- (A) 20
 - (B) ± 20
 - (C) 40
 - (D) ± 40
-

5. If $y = \sqrt{\frac{1-x}{1+x}}$, then the value of $(1-x^2)\frac{dy}{dx} + y$ is

- (A) $\frac{1}{1+x}$
 - (B) $\frac{-1}{(1+x)^2}$
 - (C) 0
 - (D) 1
-

6. The minimum value of $e^x + e^{-x}$ is

- (A) -1
 - (B) 0
 - (C) 1
 - (D) 2
-

7. The function $f(x) = \frac{x}{\log x}$ is increasing in the interval

(consider $\log_e x = \log x$)

- (A) $(1, \infty)$
- (B) (e, ∞)
- (C) $(-\infty, e)$
- (D) $(-\infty, -1)$

8. $\int e^x \left(\log x + \frac{1}{x^2} \right) dx$ is equal to

(consider $\log_e x = \log x$)

- (A) $e^x \log_e x + c$: where c is an arbitrary constant
 - (B) $e^x \left(\log_e x + \frac{1}{x} \right) + c$: where c is an arbitrary constant
 - (C) $e^x \left(\log_e x - \frac{1}{x} \right) + c$: where c is an arbitrary constant
 - (D) $e^x \cdot \frac{1}{x} + c$: where c is an arbitrary constant
-

9. If $2f(x) + f\left(\frac{1}{x}\right) = \frac{1}{x} - 5$, $x \neq 0$, then $\int_1^2 f(x) dx$ is equal to:

(consider $\log_e x = \log x$)

- (A) $\frac{1}{6} [\log 16 - 13]$
 - (B) $\frac{1}{3} [\log 8 - 13]$
 - (C) $\frac{1}{3} [\log 8 - 14]$
 - (D) $[\log 16 - 14]$
-

10. Area of the region bounded by the lines $|x| + |y| = 1$, $x \geq 0$, $y \geq 0$ is

- (A) 1 square units
 - (B) $\frac{1}{2}$ square units
 - (C) 2 square units
 - (D) 4 square units
-

11. The order and degree of the differential equation $\sqrt{1 + \left(\frac{dy}{dx}\right)^2} = \left(\frac{d^2y}{dx^2}\right)^{\frac{1}{3}}$ are

- (A) order = 2, degree = 2
 - (B) order = 2, degree = $\frac{1}{3}$
 - (C) order = 3, degree is not defined
 - (D) order = 2, degree = 3
-

12. The solution of the differential equation $\frac{dy}{dx} = \frac{x}{y}$ represents a family of

- (A) circles
 - (B) ellipses
 - (C) parabolas
 - (D) hyperbolas
-

13. The solution of initial value problem: $\frac{dy}{dx} = e^{3x+4y}$; $y(0) = -\frac{1}{4}$ is

- (A) $e^{-4y} + e^{3x} = 3e$
 - (B) $3e^{-4y} + 4e^{3x} = 3e + 4$
 - (C) $-4e^{-4y} + 3e^{3x} = 3e + 4$
 - (D) $e^{-4y} - 3e^{3x} = 0$
-

14. Three coins are tossed, then
Match the **LIST-I** with **LIST-II**

LIST-I

LIST-II

- | | |
|--|--------------------|
| A. Probability of occurrence of 3 heads or 3 tails | I. $\frac{1}{8}$ |
| B. Probability of occurrence of at least two heads | II. $\frac{7}{8}$ |
| C. Probability of occurrence of at most two heads | III. $\frac{1}{2}$ |
| D. Probability of occurrence of no head | IV. $\frac{1}{4}$ |

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

15. Match the LIST-I with LIST-II

LIST-I	LIST-II
Inequality	Solution Space
A. $2x + 3y \geq 6$ I.	half plane contains the origin, also points on the line $2x + 3y = 6$
B. $2x + 3y \leq 6$ II.	half plane contains the origin but not points on the line $2x + 3y = 6$
C. $2x + 3y > 6$ III.	half plane not contains the origin but contains points on the line $2x + 3y = 6$
D. $2x + 3y < 6$ IV.	half plane neither contains the origin nor contains points on the line $2x + 3y = 6$

Choose the **correct** answer from the options given below:

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

16. Relation R in the set $A = \{1, 2, 3, 4, \dots, 16\}$ defined as $R = \{(x, y) : 3x = y, x, y \in A\}$, then which of the following are correct ?

- A. domain of $R = \{1, 2, 3, 4, 5\}$.
- B. range of $R = \{3, 6, 9, 12, 15\}$.
- C. R is reflexive.
- D. R is not symmetric.

Choose the **correct** answer from the options given below:

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

17. A function $f : N \rightarrow N$, (N : set of natural numbers) defined by $f(x) = x^2 + x + 1$ is

- (A) one-one and onto
- (B) one-one but not onto
- (C) many-one and onto
- (D) many-one but not onto

18. Match the LIST-I with LIST-II

LIST-I		LIST-II	
Function		Range (Principal value)	
A. $\tan^{-1} x$	I.	$[0, \pi] - \left\{\frac{\pi}{2}\right\}$	
B. $\sec^{-1} x$	II.	$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$	
C. $\operatorname{cosec}^{-1} x$	III.	$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{0\}$	
D. $\sin^{-1} x$	IV.	$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$	

Choose the **correct** answer from the options given below:

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

19. If A is square matrix such that $A^2 = A$, then $(2I + A)^4 - 65A$ is equal to
(Where I is identity matrix)

- (A) $8I$
 - (B) $16I$
 - (C) $16I + A$
 - (D) $8I + A$
-

20. If $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$, such that $A^2 - 4A + \lambda I = 0$, where I is identity matrix of order 2, then ' λ ' is equal to

- (A) -1
 - (B) 1
 - (C) -2
 - (D) 2
-

21. If $A = [a_{ij}]_{3 \times 3}$, $a_{ij} = \begin{cases} 0, & i \neq j \\ i + j, & i = j \end{cases}$, then which of the following statements are correct ?

- A. A is scalar matrix
- B. A is diagonal matrix
- C. A is unit matrix
- D. A is symmetric matrix

Choose the **correct** answer from the options given below:

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

22. If $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ are the vertices of an equilateral triangle whose each side is equal to k , then the value of $\begin{vmatrix} x_1 & y_1 & 2 \\ x_2 & y_2 & 2 \\ x_3 & y_3 & 2 \end{vmatrix}^2$ is

- (A) $3k^2$
- (B) $4k^2$
- (C) $3k^4$
- (D) $4k^4$

23. If x, y, z are all different from zero and $\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix} = 0$, then the value of $x^{-1} + y^{-1} + z^{-1}$ is

- (A) xyz
 (B) -1
 (C) 1
 (D) 0

24. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 3 & 3 & 0 \\ 5 & 2 & -1 \end{bmatrix}$, then

Match the LIST-I with LIST-II

LIST-I	LIST-II
A. $ \text{adj } A $	I. 81
B. $ A $	II. -27
C. $ A \text{ adj } A $	III. 9
D. $ \text{adj}(\text{adj } A) $	IV. -3

Choose the **correct** answer from the options given below:

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

25. Function $f(x) = \begin{cases} k(x^2 - 6x + 13) & : x < 1 \\ |x - 3| & : x \geq 1 \end{cases}$ is differentiable at $x = 1$, then the value of k is

- (A) 4
 - (B) $\frac{1}{4}$
 - (C) $\frac{-1}{4}$
 - (D) -4
-

26. If $y = x^x$, $x > 0$ then $y''(2) - 2y'(2)$ is equal to

- (A) $8 \log_e 2 - 2$
 - (B) $4(\log_e 2)^2 + 2$
 - (C) $4(\log_e 2)^2 - 2$
 - (D) $4(\log_e 2) + 2$
-

27. If $x = \sec \theta + \cos \theta$, $y = \sec^n \theta + \cos^n \theta$, then $\frac{dy}{dx}$ is equal to

- (A) $\frac{n^2(y^2+4)}{x^2+4}$
 - (B) $\frac{n^2(y^2-4)}{x^2-4}$
 - (C) $n \left(\sqrt{\frac{y^2+4}{x^2+4}} \right)$
 - (D) $n \left(\sqrt{\frac{y^2-4}{x^2-4}} \right)$
-

28. If $f(x) = (x - a)^2 + (x - b)^2 + (x - c)^2$, then $f(x)$ has minimum at x equal to:

- (A) $3\sqrt{abc}$
 - (B) $3abc$
 - (C) $\frac{a+b+c}{3}$
 - (D) $\frac{3}{\frac{1}{a} + \frac{1}{b} + \frac{1}{c}}$
-

29. For the Function $f(x) = \tan x - 4x$, $x \in (0, \frac{\pi}{2})$, which of the following statements are correct?

- A. $f(x)$ is increasing in $(0, \frac{\pi}{3})$
- B. $f(x)$ is increasing in $(\frac{\pi}{3}, \frac{\pi}{2})$
- C. $f(x)$ is decreasing in $(0, \frac{\pi}{3})$
- D. $f(x)$ is decreasing in $(\frac{\pi}{3}, \frac{\pi}{2})$

Choose the *correct* answer from the options given below:

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

30. The difference between the greatest and least values of the function $f(x) = \sin 2x - x$ on $[-\frac{\pi}{2}, \frac{\pi}{2}]$ is

- (A) $\frac{\pi}{2}$
- (B) $\frac{-\sqrt{3}}{2} + \frac{\pi}{6}$
- (C) π
- (D) $\frac{\sqrt{3}}{2} - \frac{\pi}{6}$

31. Match the LIST-I with LIST-II

LIST-I	LIST-II
Indefinite Integral	Solution (where c is an arbitrary constant)
A. $\int \sqrt{16-x^2} dx$	I. $\sin^{-1}\left(\frac{x}{4}\right) + c$
B. $\int \frac{dx}{\sqrt{16-x^2}}$	II. $\frac{x}{2}\sqrt{16-x^2} + 8\sin^{-1}\left(\frac{x}{4}\right) + c$
C. $\int \frac{dx}{\sqrt{x^2-16}}$	III. $\frac{1}{8}\log\left \frac{4+x}{4-x}\right + c$
D. $\int \frac{dx}{16-x^2}$	IV. $\log\left x + \sqrt{x^2-16}\right + c$

Choose the *correct* answer from the options given below:

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

32. $\int_{-\pi/2}^{\pi/2} \frac{\cos x}{1+e^x} dx =$

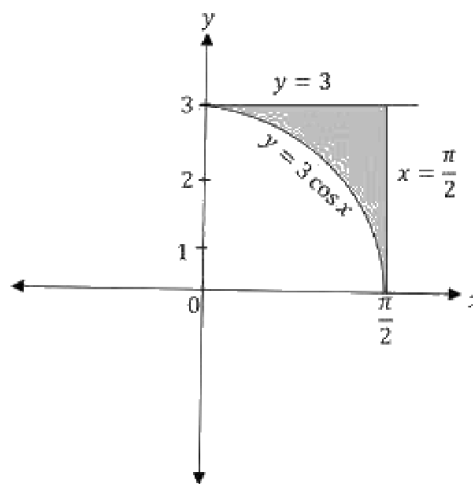
- (A) 0
 - (B) 1
 - (C) -1
 - (D) 2
-

33. $\int \frac{dx}{(x+1)\sqrt{x^2-1}}$ is equal to:
[c is an arbitrary constant]

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



34. In the given figure, area of the shaded portion is equal to



- (A) 3
 (B) $\frac{3\pi}{2}$
 (C) $3\left(\frac{\pi}{2} - 1\right)$
 (D) $3(\pi - 1)$



35. The area of the region bounded by the line $y = 3x + 2$, the x -axis and the ordinates $x = -1$ and $x = 1$ is:

- (A) $\frac{25}{6}$
 (B) 4
 (C) 0
 (D) $\frac{13}{3}$

36. Match the **LIST-I** with **LIST-II**

LIST-I	LIST-II
Differential Equations	Solutions[c is an arbitrary constant]
A. $x dy = y dx$	I. $y = e^x + c$
B. $\log\left(\frac{dy}{dx}\right) = x$	II. $y = c e^x$
C. $\frac{y dx - dy}{y} = 0$	III. $xy = c$
D. $x dy + y dx = 0$	IV. $y = cx$

Choose the **correct** answer from the options given below:

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

37. The general solution of the differential equation of the type $\frac{dy}{dx} + py = Q$ is:

(where P and Q are functions of x only or constant)

- (A) $y e^{\int p dy} = \int (Q e^{\int p dy}) dy + c$: (where c is an arbitrary constant)
- (B) $y e^{\int p dx} = \int (Q e^{\int p dx}) dx + c$: (where c is an arbitrary constant)
- (C) $x e^{\int p dy} = \int (Q e^{\int p dy}) dy + c$: (where c is an arbitrary constant)
- (D) $x e^{\int p dx} = \int (Q e^{\int p dx}) dx + c$ (where c is an arbitrary constant)

38. Match the LIST-I with LIST-II

LIST-I	LIST-II
A. If $ \vec{a} = \sqrt{26}$, $ \vec{b} = 7$ and $ \vec{a} \times \vec{b} = 35$, then $ \vec{a} \cdot \vec{b} $ is equal to	I. 4
B. If $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $a\hat{i} - 6\hat{j} + 8\hat{k}$ are collinear, then 'a' is equal to	II. 2
C. If $2\hat{i} + \hat{j} + \hat{k}$ and $2\hat{i} - 4\hat{j} + \lambda\hat{k}$ are perpendicular, then λ is equal to	III. 7
D. $(\hat{i} \times \hat{j}) \cdot \hat{k} + (\hat{j} \times \hat{k}) \cdot \hat{i}$ is equal to	IV. 0

Choose the **correct** answer from the options given below:

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

39. If $\vec{a} = x\hat{i} + x\hat{j} + y\hat{k}$, $\vec{b} = \hat{i} + \hat{k}$ and $\vec{c} = y\hat{i} + y\hat{j} + z\hat{k}$ are three vectors such that $\vec{a} \times \vec{b} \perp \vec{c}$, then

- (A) $y^2 = xz$
 - (B) $x^2 = yz$
 - (C) $z^2 = xy$
 - (D) $xyz = 1$
-

40. If $\vec{a}$ is any vector, then the value of $|\vec{a} \times \hat{i}|^2 + |\vec{a} \times \hat{j}|^2 + |\vec{a} \times \hat{k}|^2$ is equal to

- (A) $2|\vec{a}|^2$
 - (B) $|\vec{a}|^2$
 - (C) $4|\vec{a}|^2$
 - (D) $3|\vec{a}|^2$
-

41. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three unit vectors such that $\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c} = 0$ and angle between $\vec{b}$ and $\vec{c}$ is $\frac{\pi}{6}$, then

- (A) $\vec{a} = \vec{b} \times \vec{c}$
 - (B) $\vec{a} = \pm(\vec{b} \times \vec{c})$
 - (C) $\vec{a} = 2(\vec{b} \times \vec{c})$
 - (D) $\vec{a} = \pm 2(\vec{b} \times \vec{c})$
-

42. If α, β, γ are angles of inclinations of a line with x, y and z -axis respectively, then which of the following are correct?

- A. $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$
- B. $\cos 2\alpha + \cos 2\beta + \cos 2\gamma = -1$
- C. $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = -2$
- D. $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 2$

Choose the correct answer from the options given below:

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

43. The lines $x = py + q$, $z = ry + s$ and $x = p'y + q'$, $z = r'y + s'$ are perpendicular if

- (A) $pp' + rr' = 0$
- (B) $pp' + rr' + 1 = 0$
- (C) $\frac{p}{p'} = \frac{r}{r'}$
- (D) $pp' = rr'$

44. Two lines L_1 and L_2 are given as $L_1 : \vec{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(2\hat{i} + 3\hat{j} + 4\hat{k})$ and $L_2 : \vec{r} = (2\hat{i} + 4\hat{j} + 5\hat{k}) + \mu(4\hat{i} + 6\hat{j} + 8\hat{k})$, where λ and μ are real parameters. Then which of the following statements are correct ?

- A. Shortest distance between line L_1 and L_2 is $\sqrt{\frac{5}{29}}$.
- B. line L_1 and L_2 are parallel.
- C. line L_1 and L_2 are concurrent lines.
- D. line L_1 and L_2 are perpendicular.

Choose the **correct** answer from the options given below:

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

45. The objective function of a LPP is given by $z = ax + by$, where a and b are constants. If minimum of z occurs at two points $(50, 30)$ and $(20, 40)$, then

- (A) $3b = a$
- (B) $3b + a = 0$
- (C) $3a + b = 0$
- (D) $3a - b = 0$

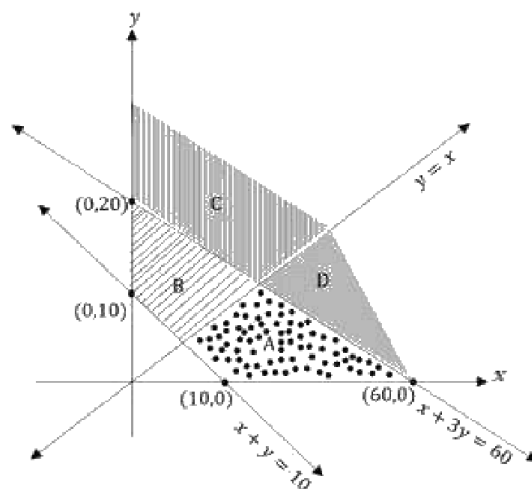


46. In the linear programming problem:

Minimize $z = x + y$, subject to the constraints:

$$x + 3y \leq 60, x + y \geq 10, x \leq y, x \geq 0, y \geq 0$$

Which of the following region in graph given below represents the feasible region of the above LPP?



- (A) A
- (B) B
- (C) C
- (D) D



47. A speaks truth in 80% cases and B in 90% cases. The probability that they contradict each other in stating the same fact, is:

- (A) $\frac{17}{50}$
- (B) $\frac{13}{50}$
- (C) $\frac{19}{50}$
- (D) $\frac{11}{50}$



48. If A and B are two events such that $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$ and $P(A \cap B) = \frac{1}{4}$, then $P\left(\frac{A'}{B}\right) =$

- (A) $\frac{3}{4}$
- (B) $\frac{1}{4}$
- (C) $\frac{1}{2}$
- (D) $\frac{5}{8}$



49. The probability of the simultaneous occurrence of two events A and B is p . If the probability that exactly one of A and B occurs is q , then

- A. $P(\bar{A}) + P(\bar{B}) = 2 + 2q - p$
- B. $P(\bar{A}) + P(\bar{B}) = 2 - 2p - q$
- C. $P(\bar{A} \cap \bar{B}) = 1 - p - q$
- D. $P((A \cap B)|(A \cup B)) = \frac{p}{p+q}$

Choose the **correct** answer from the options given below:

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



50. A letter is known to have come for 'RAVINDRA' or 'DEVINDRAN'. On the envelop just two consecutive letters 'RA' are visible. The probability that the letter has come for 'RAVINDRA' is:

- (A) $\frac{16}{23}$
 - (B) $\frac{7}{11}$
 - (C) $\frac{4}{11}$
 - (D) $\frac{7}{23}$
-

51. The effective rate that is equivalent to a nominal rate of 6% per annum compounded semi-annually is

- (A) 6%
 - (B) 6.09%
 - (C) 0.069%
 - (D) 9.06%
-

52. Assume an investment's starting value is Rs. 10,000 and it grows to Rs. 60,000 in 4 years, then the CAGR % of the investment is,
[given : $(6)^{1/4} = 1.565$]

- (A) 65%
 - (B) 56.5%
 - (C) 65.5%
 - (D) 55.6%
-

53. Vishal purchased a machine costing Rs. 50,000. The estimated useful life of the machine is 10 years with a scrap value of Rs. 5,000. The annual depreciation using linear method is,

- (A) Rs. 45,000
 - (B) Rs. 4,500
 - (C) Rs. 3500
 - (D) Rs. 2500
-

54. Vatsala takes a loan of Rs. 2,00,000 at an interest rate of 10% per annum for 5 years. Her EMI using flat rate method is,

- (A) Rs. 20,000
 - (B) Rs. 1,666.6
 - (C) Rs. 5,000
 - (D) Rs. 15,000
-

55. Face value of a bond is

- (A) the rate at which a bond yields interest
 - (B) the price at which the bond is sold to buyers at the time of issue
 - (C) the annual interest rate paid by the bond issuer to the bond holder
 - (D) the discount rate which returns the market price of a bond without embedded optionality
-

56. At what rate of interest per annum will the present value of a perpetuity of Rs. 500 payable at the end of every 6 months be Rs. 10,000?

- (A) 15%
- (B) 10%
- (C) 20%
- (D) 25%



57. Let X denote the number of hours a person drive during a randomly selected working day. The probability that X can take the value x_i has the following form, where k is some unknown constant.

$$P(X = x_i) = \begin{cases} 0.2, & \text{if } x_i = 0 \\ kx_i, & \text{if } x_i = 1 \text{ or } 2 \\ k(4 - x_i), & \text{if } x_i = 3 \\ 0, & \text{otherwise} \end{cases}$$

Match the **LIST-I** with **LIST-II**

LIST-I	LIST-II
A. The value of k	I. 1
B. The probability that the person drive atleast two hours on a selected working day	II. 0.4
C. The probability that the person drive atmost three hours on a selected working day	III. 0.2
D. The probability that the person drive atmost one hour on a selected working day	IV. 0.6

Choose the **correct** answer from the options given below:

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

58. Match the LIST-I with LIST-II

LIST-I	LIST-II
A. In a binomial distribution, if $n = 20$, $q = 0.75$ then its mean is	I. 25
B. An unbiased coin is tossed 4 times. The mean of the number of tails is	II. 5
C. In a binomial distribution, mean is 5 and variance is 4, then the number of trials is	III. 0.5
D. In a binomial distribution, if mean is 8 and variance is 4, then the probability of success is	IV. 2

Choose the **correct** answer from the options given below:

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

59. If X is a Poisson variate such that $4P(X = 2) = 3P(X = 1)$, then the mean of the distribution is equal to:

- (A) 1.5
 - (B) 2
 - (C) 3
 - (D) 4
-

60. In a math aptitude test, students scores are found to be normally distributed having mean as 45 and standard deviation 5. What percent of students scored more than the mean score?

- (A) 45%
 - (B) 50%
 - (C) 5%
 - (D) 60%
-

61. If $y = e^{4x}(92)^x$; then $\frac{dy}{dx}$ is equal to $(\log_e x = \log x)$

- (A) $4x e^{4x} \cdot 92^{x-1}$
 - (B) $e^{4x}92^{x-1}[368 + x]$
 - (C) $e^{4x}(92)^x[4 + \log 92]$
 - (D) $e^{4x}92^x \log 92$
-

62. The order and degree of the following differential equation:

$y = px + \sqrt{a^2 p^2 + b^2}$, where $p = \frac{dy}{dx}$, are

- (A) Order = 2 : degree = 2
 - (B) Order = 1 : degree = 1
 - (C) Order = 1 : degree = 2
 - (D) Order = 2 : degree = 1
-

63. The demand function for a certain product is represented by the equation $p = 150 + 12x - x^2$, where x is the number of units demanded and p is the price per unit. The marginal revenue when 5 units are sold is

- (A) Rs. 195
 - (B) Rs. 282
 - (C) Rs. 91
 - (D) Rs. 185
-

64. The function $f(x) = 4x^3 - 18x^2 + 27x - 7$ has:-

- (A) Maxima at $x = \frac{3}{2}$
 - (B) Minima at $x = \frac{3}{2}$
 - (C) Point of inflexion at $x = \frac{3}{2}$
 - (D) Maximum value of function is 156
-

65. The function $f(x) = \frac{2}{x} + 5$, $x \neq 0$ is

- (A) increasing function for $x \in \mathbb{R} - \{0\}$
 - (B) increasing function for $x \in (0, \infty)$
 - (C) neither increasing nor decreasing function for $x \in (0, \infty)$
 - (D) decreasing function for $x \in \mathbb{R} - \{0\}$
-

66. $\int (x + 1)e^x dx$ is equal to
[C is an arbitrary constant]

- (A) $(x + 1)e^x + C$
- (B) $e^x + C$
- (C) $xe^x + C$
- (D) $(x + 1) + C$

67. Particular solution of the differential equation $(x - 1)\frac{dy}{dx} = 2xy$, when $y(2) = 1$ is:- (consider $\log_e x = \log x$)

- (A) $\log |y| + \log (x - 1)^2 = 2x + 4$
- (B) $\log |y| - \log (x - 1)^2 = 2x - 4$
- (C) $\log |y| + \log (x - 1)^2 = 2x - 4$
- (D) $\log |y| - \log (x - 1)^2 = 2x + 4$

68. Let R be the feasible region for a linear programming problem, and Let $z = ax + by$ be the objective function. If the feasible region R is bounded then which of the following are true ?

- A. The maximum or minimum value of objective function may not exist.
 - B. The objective function z has both a maximum and a minimum value on R .
 - C. Maximum and minimum values lie in the unbounded region
 - D. The objective function $z = ax + by$ has both a maximum value and a minimum value and each of these values occurs at a corner point of R .
- Choose the **correct** answer from the options given below:

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

69. Consider a LPP given by

Maximize $Z = 38x + 19y$

Subject to $3x + 5y \leq 15$, $5x + 2y \leq 10$, and $x, y \geq 0$

The optimum value of Z is,

- (A) 85
 - (B) 190
 - (C) 240
 - (D) 57
-

70. Which of the following is/are true about parameter ?

A. It is a characteristic of a sample.

B. It is a characteristic of a population.

C. It is a numerical value that is taken from the entire population, such as the population mean.

D. It is the numerical value taken from a sample and calculated from the sample observations alone.

Choose the *correct* answer from the options given below:

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

71. Consider a office having seating capacity of 58 employees and all of them are to be seated in such a way that an employee can sit on any available vacant seat . What will be the degree of freedom?

- (A) 58
- (B) 57
- (C) 59
- (D) 58.5

72. The following data are from a simple random sample: 3 , 7 , 4 , 12 , 4 , 12. The point estimate of the population mean is,

- (A) 42
- (B) 7
- (C) 24
- (D) 6

73. The patterns and behavior of the data in any time series are based on which of the following components.

- A. Seasonal component
- B. Secular trend component
- C. Irregular component
- D. Cyclical component

Choose the correct answer from the options given below:

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

74. The number of wedding cards, in thousands, distributed in a certain city on each day for a week is given as follows:-

21, 35, 19, 27, 32, 22, 12.

The three days moving averages will be:

- (A) 25, 28, 26, 23, 21
- (B) 25, 24, 23, 27, 26
- (C) 25, 27, 26, 27, 22
- (D) 24, 28, 26, 22, 25

75. Match the **LIST-I** with **LIST-II**

LIST-I	LIST-II
Matrix A	$ \text{adj } A $
A. $A = \begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$	I. 1
B. $A = \begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}$	II. 7
C. $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$	III. 2
D. $A = \begin{bmatrix} 6 & 1 \\ 5 & 2 \end{bmatrix}$	IV. 6

Choose the *correct* answer from the options given below:

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

76. For a given square matrix A of order n , if there exists another square matrix B of the same order n , such that $AB = BA = I$, then A is said to be invertible and B is called the inverse matrix of A .

Which of the following statements are not TRUE ?

- A. Inverse of a matrix, if it exists, is unique.
- B. For two invertible matrices of same order, say A and B , then $(AB)^{-1} = A^{-1}B^{-1}$
- C. For an invertible matrix A , $(A^{-1})^{-1} = A$
- D. For an invertible matrix A , $(A^T)^{-1} = A^T$

Choose the correct answer from the options given below:

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

77. Match the LIST-I with LIST-II

LIST-I	LIST-II
A. If A is a square matrix of order 3 such that $ A = 3$, then $ adj(adjA) =$	I. 16
B. If A is a non-singular matrix and $ A = \frac{1}{16}$, then $ A^{-1} =$	II. 512
C. If A is a square matrix of order 4 such that $ A = 2$, then $ adj(adjA) =$	III. 9
D. If A is a square matrix of order 2 such that $ A = 9$, then $ adj(adjA) =$	IV. 81

Choose the correct answer from the options given below:

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

78. Match the LIST-I with LIST-II

LIST-I		LIST-II
A. Row matrix	I.	$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$
B. Scalar matrix	II.	$\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$
C. Column matrix	III.	$\begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$
D. Diagonal matrix	IV.	$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

Choose the correct answer from the options given below:

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

79. The sum of two skew-symmetric matrices of the same order is a

- (A) symmetric matrix
- (B) zero matrix
- (C) skew-symmetric matrix
- (D) diagonal matrix

80. Which of the following properties are not correct for three real numbers a , b and c ?

- A. If $a > b$ and $b > c$, then $a < c$
- B. If $a > b$, and $c < 0$, then $ac < bc$
- C. If $a > b$, and $c < 0$, then $a \div c < b \div c$
- D. If $a > b$ and $c > 0$, then $a \div c < b \div c$

Choose the correct answer from the options given below:

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

81. A tin container contains 50 litres of cow milk. From this container 5 litres cow milk was taken out and replaced with soya milk. This process was repeated further two more times. How much cow milk is there in the container now?

- (A) 364.5 litres
 - (B) 36.45 litres
 - (C) 3.645 litres
 - (D) 40 litres
-

82. If $53 \equiv y \pmod{6}$, then the possible values of y are:-

- (A) 64, 58, 52, 46, 40, ...
 - (B) 70, 76, 81, 87, 93, 98, ...
 - (C) 65, 59, 53, 47, 41, ...
 - (D) 70, 76, 82, 88, 94, 97
-

83. A man can row a boat in still water at the rate of 17 km/hr. He finds that it takes him thrice as long to row upstream of a river as to row downstream of the same river. The speed of of the stream is,

- (A) 15 km/hr
 - (B) 11.5 km/hr
 - (C) 8.5 km/hr
 - (D) 6 km/hr
-

84. Two pipes A and B can fill a tank in 12 minutes and 15 minutes respectively while a third pipe C can empty the full tank in 20 minutes. All the three pipes are opened in the beginning but pipe C is closed 6 minutes before the tank is filled. In what time will the tank is full?

- (A) 15 minutes
 - (B) 10 minutes
 - (C) 7 minutes
 - (D) 17 minutes
-

85. In a 700 m race, A reaches the finishing point in 30 seconds & B reaches in 35 seconds. By how much distance A beats B?

- (A) 75 m
- (B) 50 m
- (C) 100 m
- (D) 200 m