CUET PG 2025 Mathematics Question Paper with Solutions

Time Allowed :1 Hour 30 Mins	**Maximum Marks :**300	**Total Questions :**75

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The examination duration is 90 minutes. Manage your time effectively to attempt all questions within this period.
2. The total marks for this examination are 300. Aim to maximize your score by strategically answering each question.
3. There are 75 mandatory questions to be attempted in the Agro forestry paper. Ensure that all questions are answered.
4. Questions may appear in a shuffled order. Do not assume a fixed sequence and focus on each question as you proceed.
5. The marking of answers will be displayed as you answer. Use this feature to monitor your performance and adjust your strategy as needed.
6. You may mark questions for review and edit your answers later. Make sure to allocate time for reviewing marked questions before final submission.
7. Be aware of the detailed section and sub-section guidelines provided in the exam. Understanding these will aid in effectively navigating the exam.

---

1. If p is a prime number and a group G is of the order p^2, then G is:

(A) trivial
(B) non-abelian
(C) non-cyclic
(D) either cyclic of order p^2 or isomorphic to the product of two cyclic groups of order p each

---

2. If $S = \lim_{n\to\infty} \left(1 - \frac{1}{2^2}\right)\left(1 - \frac{1}{3^2}\right)\dots\left(1 - \frac{1}{n^2}\right)$**, then S is equal to:**

(A) 0
(B) $\frac{1}{4}$
(C) $\frac{1}{2}$
(D) 1

---

3. Let R be the planar region bounded by the lines x = 0, y = 0 and the curve $\mathbf{x^2 + y^2 = 4}$ in the first quadrant. Let C be the boundary of R, oriented counter clockwise. Then, the value of $\oint_C x(1-y)dx + (x^2 - y^2)dy$ is equal to:

(A) 0
(B) 2
(C) 4
(D) 8

---

4. Let [x] be the greatest integer function, where x is a real number, then $\int_0^1 \int_0^1 \int_0^1 ([x] + [y] + [z])\, dx\, dy\, dz =$

(A) 0
(B) $\frac{1}{3}$
(C) 1
(D) 3

---

5. Let V(F) be a finite dimensional vector space and T: V $\rightarrow$ V be a linear transformation. Let R(T) denote the range of T and N(T) denote the null space of T. If rank(T) = rank($\mathbf{T^2}$), then which of the following are correct?
A. N(T) = R(T)
B. N(T) = N($\mathbf{T^2}$)
C. N(T) $\cap$ R(T) = {0}
D. R(T) = R($\mathbf{T^2}$)

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

---

6. Match List-I with List-II and choose the correct option:

LIST-I	LIST-II
A. The solution of an ordinary differential equation of order 'n' has	**I. singular solution**
B. The solution of a differential equation which contains no arbitrary constant is	**II. complete primitive**
C. The solution of a differential equation which is not obtained from the general solution is	**III. 'n' arbitrary constants**
D. The solution of a differential equation containing as many as arbitrary constants as the order of a differential equation is	**IV. particular solution**

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

---

7. For the function $f(x, y) = x^3 + y^3 - 3x - 12y + 12$, which of the following are correct:
A. minima at (1,2)
B. maxima at (-1,-2)
C. neither a maxima nor a minima at (1,-2) and (-1,2)
D. the saddle points are (-1,2) and (1,-2)

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

---

8. Which of the following statement is true:

(A) Continuous image of a connected set is connected
(B) The union of two connected sets, having non-empty intersection, may not be a connected set
(C) The real line $\mathbb{R}$ is not connected
(D) A non-empty subset X of $\mathbb{R}$ is not connected if X is an interval or a singleton set

---

9. Match List-I with List-II and choose the correct option:

LIST-I (Function)	LIST-II (Value)
A. $\int_\gamma \frac{1}{z-a}dz$, **where** $\gamma : \lvert z-a\rvert = r, r > 0$	**I.** $-4+2i\pi$
B. $\int_\gamma \frac{z+2}{z}dz$, **where** $\gamma : z = 2e^{it}, 0 \leq t \leq \pi$	**II.** $2i\pi(e^4 - e^2)$
C. $\int_\gamma \frac{e^{2z}}{(z-1)(z-2)}dz$, **where** $\gamma : \lvert z\rvert = 3$	**III.** $2i\pi$
D. $\int_\gamma \frac{z^2-z+1}{2(z-1)}dz$, **where** $\gamma : \lvert z\rvert = 2$	**IV.** $i\pi$

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

---

10. Consider the following: Let f(z) be a complex valued function defined on a subset $S \subset \mathbb{C}$ of complex numbers. Then which of the following are correct?
A. The order of a zero of a polynomial equals to the order of its first non-vanishing derivative at that zero of the polynomial
B. Zeros of non-zero analytic function are isolated
C. Zeros of f(z) are obtained by equating the numerator to zero if there is no common factor in the numerator and the denominator of f(z)
D. Limit points of zeros of an analytic function is an isolated essential singularity

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

---

11. Which of the following are correct?
A. A set $S = \{(x,y)|xy \leq 1 : x, y \in \mathbb{R}\}$ **is a convex set**
B. A set $S = \{(x,y)|x^2 + 4y^2 \leq 12 : x, y \in \mathbb{R}\}$ **is a convex set**
C. A set $S = \{(x,y)|y^2 - 4x \leq 0 : x, y \in \mathbb{R}\}$ **is a convex set**
D. A set $S = \{(x,y)|x^2 + 4y^2 \geq 12 : x, y \in \mathbb{R}\}$ **is a convex set**

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

---

12. The value of $\lim_{n\to\infty}(\sqrt{4n^2+n} - 2n)$ **is:**

(A) $\frac{1}{2}$
(B) 0

(C) $\frac{1}{4}$
(D) 1

---

13. Match List-I with List-II and choose the correct option:

LIST-I (Set)	**LIST-II (Supremum/Infimum)**
A. $S = \{2, 3, 5, 10\}$	**I. Inf S = 2**
B. $S = (1, 2] \cup [3, 8)$	**II. Sup S = 5, Inf S = -5**
C. $S = \{2, 2^2, 2^3, \ldots, 2^n, \ldots\}$	**III. Sup S = 10, Inf S = 2**
D. $S = \{x \in \mathbb{Z} : x^2 \leq 25\}$	**IV. Sup S = 8, Inf S = 1**

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

---

14. Match List-I with List-II and choose the correct option:

LIST-I (Differential Equation)	**LIST-II (Integrating Factor)**
A. $(y - y^2)dx + xdy = 0$	**I.** $\tan x$
B. $(xy + y + e^x)dx + (x + e^x)dy = 0$	**II.** $\frac{1}{x^2y^2}$
C. $\sin 2x\frac{dy}{dx} + 2y = 2\cos 2x$	**III.** e^x
D. $(2xy^2 + y)dx + (2y^3 - x)dy = 0$	**IV.** $\frac{1}{y^2}$

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

---

15. The function $f(z) = |z|^2$ is differentiable, at

(A) $z = 0$
(B) for all $z \in \mathbb{C}$
(C) no $z \in \mathbb{C}$
(D) $z \neq 0$

---

16. If C is the positively oriented circle represented by $|z| = 2$, then $\int_C \frac{e^{2z}}{z-4}dz$ is:

(A) $\frac{2\pi i}{3}$
(B) πi

(C) $\frac{4\pi i}{3}$
(D) $\frac{8\pi i}{3}$

---

17. Let f be a continuous function on $\mathbb{R}$ and $F(x) = \int_{x-2}^{x+2} f(t)dt$, then F'(x) is

(A) $f(x-2) - f(x+2)$
(B) $f(x-2)$
(C) $f(x+2)$
(D) $f(x+2) - f(x-2)$

---

18. If C is a triangle with vertices (0,0), (1,0) and (1,1) which are oriented counter clockwise, then $\oint_C 2xydx + (x^2 + 2x)dy$ is equal to:

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

---

19. The integral domain of which cardinality is not possible:
A. 5
B. 6
C. 7
D. 10

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

---

20. Let $m, n \in \mathbb{N}$ such that $m < n$ and $P_{m\times n}(\mathbb{R})$ and $Q_{n\times m}(\mathbb{R})$ are matrices over real numbers and let $\rho(V)$ denotes the rank of the matrix V. Then, which of the following are NOT possible.
A. $\rho(PQ) = n$
B. $\rho(QP) = m$
C. $\rho(PQ) = m$
D. $\rho(QP) = \lfloor (m+n)/2 \rfloor$**, where $\lfloor\rfloor$ is the greatest integer function**

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

---

21. Which of the following are subspaces of vector space $\mathbb{R}^3$:
A. $\{(x, y, z) : x + y = 0\}$
B. $\{(x, y, z) : x - y = 0\}$
C. $\{(x, y, z) : x + y = 1\}$
D. $\{(x, y, z) : x - y = 1\}$

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

---

22. Maximize $Z = 2x + 3y$, subject to the constraints:
$x + y \leq 2$
$2x + y \leq 3$
$x, y \geq 0$

(A) 5
(B) 6
(C) 7
(D) 10

---

23. Which one of the following mathematical structure forms a group?

(A) $(\mathbb{N}, *)$, where $a * b = a$ for all $a, b \in \mathbb{N}$
(B) $(\mathbb{Z}, *)$, where $a * b = a - b$, for all $a, b \in \mathbb{Z}$
(C) $(\mathbb{R}, *)$, where $a * b = a + b + 1$, for all $a, b \in \mathbb{R}$
(D) $(\mathbb{R}, *)$, where $a * b = |a|b$, for all $a, b \in \mathbb{R}$

---

24. If $A = \begin{pmatrix} 2 & 4 & 1 \\ 0 & 2 & -1 \\ 0 & 0 & 1 \end{pmatrix}$ satisfies $A^3 + \mu A^2 + \lambda A - 4I_3 = 0$, then the respective values of λ and μ are:

(A) -5, 8
(B) 8, -5
(C) 5, -8
(D) -8, 5

---

25. Let A and B be two symmetric matrices of same order, then which of the following statement are correct:
A. AB is symmetric
B. A+B is symmetric
C. $A^T B = AB^T$
D. $BA = (AB)^T$

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

---

26. Match List-I with List-II and choose the correct option:

LIST-I (Infinite Series)	**LIST-II (Nature of Series)**
A. $12 - 7 - 3 - 2 + 12 - 7 - 3 - 2 + \ldots$	**I. convergent**
B. $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \ldots$	**II. oscillatory**
C. $\sum_{n=0}^{\infty}\{(n^3+1)^{1/3} - n\}$	**III. divergent**
D. $\sum_{n=1}^{\infty} \frac{1}{n(1+\frac{1}{n})}$	**IV. conditionally convergent**

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

---

27. Consider the function $f(x, y) = x^2 + xy^2 + y^4$**, then which of the following statement is correct:**

(A) $f(x, y)$ has neither a maxima nor a minima at the origin (0,0)
(B) $f(x, y)$ has a minimum value at the origin (0, 0)
(C) origin (0, 0) is a saddle point of $f(x, y)$
(D) $f(x, y)$ has a maximum value at the origin (0, 0)

---

28. If $f(z) = (x^2 - y^2 - 2xy) + i(x^2 - y^2 + 2xy)$ **and** $f'(z) = cz$**, where c is a complex**

constant, then $|c|$ is equals to:

(A) $\sqrt{3}$
(B) $\sqrt{2}$
(C) $3\sqrt{3}$
(D) $2\sqrt{2}$

---

29. Match List-I with List-II and choose the correct option:

LIST-I (Differential)	LIST-II (Order/degree / nature)
A. $\left(y + x\left(\frac{dy}{dx}\right)^2\right)^{5/3} = x\frac{d^2y}{dx^2}$	**I. order = 2, degree = 2, non-linear**
B. $\left(\frac{d^2y}{dx^2}\right)^{1/3} = \left(y + \frac{dy}{dx}\right)^{1/2}$	**II. order = 1, degree = 1, linear**
C. $y = x\frac{dy}{dx} + \left[1 + \left(\frac{dy}{dx}\right)^2\right]^{1/2}$	**III. order = 2, degree = 3, non-linear**
D. $(2 + x^3)\frac{dy}{dx} = (e^{\sin x})^{1/2} + y$	**IV. order = 1, degree = 2, non-linear**

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

---

30. The solution of the differential equation $\frac{xdy - ydx}{xdx + ydy} = \sqrt{x^2 + y^2}$ is:

(A) $\frac{x}{y} = \sin^{-1}\sqrt{1 - x^2} + C$; where C is a constant
(B) $\sqrt{x^2 + y^2} = \tan^{-1}\frac{y}{x} + C$; where C is a constant
(C) $1 + x^2 = \tan^{-1}(y) + C$; where C is a constant
(D) $y = x\tan(\sqrt{x^2 + y^2}) + C$; where C is a constant

---

31. If, $I_n = \int_{-\pi}^{\pi} \frac{\cos(nx)}{1+2^x}dx, n = 0, 1, 2, \ldots$, then which of the following are correct:
A. $I_n = I_{n+2}$**, for all** $n = 0, 1, 2, \ldots$
B. $I_n = 0$**, for all** $n = 0, 1, 2, \ldots$
C. $\sum_{n=1}^{10} I_n = 2^{10}$
D. $\sum_{n=1}^{10} I_n = 0$

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

32. The number of maximum basic feasible solution of the system of equations AX = b, where A is m $\times$ n matrix, b is n $\times$ 1 column matrix and rank of A is $\rho(A) = m$, is:

(A) $m + n$
(B) $m - n$
(C) mn
(D) ${}^nC_m$

---

33. If $\vec{F} = x^2\hat{\imath} + z\hat{\jmath} + yz\hat{k}$, for $(x, y, z) \in \mathbb{R}^3$, then $\oiint_S \vec{F} \cdot d\vec{S}$, where S is the surface of the cube formed by $x = \pm 1, y = \pm 1, z = \pm 1$, is

(A) 24
(B) 6
(C) 1
(D) 0

---

34. Find the residue of $(67 + 89 + 90 + 87) \pmod{11}$

(A) 3
(B) 0
(C) 2
(D) 1

---

35. The solution of the differential equation $(xy^3 + y)dx + (2x^2y^2 + 2x + 2y^4)dy = 0$ is:

(A) $3xy^2 + 6y^4x - 2y^6 + C$, where C is an arbitrary constant
(B) $3xy^4 + 3xy^2 + y^6 + C$, where C is an arbitrary constant
(C) $6xy^2 - 2y^4x + C$, where C is an arbitrary constant
(D) $3x^2y^4 + 6xy^2 + 2y^6 + C$, where C is an arbitrary constant

---

36. If G is a cyclic group of order 12, then the order of Aut(G) is:

(A) 1
(B) 5
(C) 4

(D) 77

---

37. Which of the following function is discontinuous at every point of $\mathbb{R}$?

(A) $f(x) = \begin{cases} 1, & \text{if } x \text{ is rational} \\ -1, & \text{if } x \text{ is irrational} \end{cases}$

(B) $f(x) = \begin{cases} x, & \text{if } x \text{ is rational} \\ 0, & \text{if } x \text{ is irrational} \end{cases}$

(C) $f(x) = \begin{cases} x, & \text{if } x \text{ is rational} \\ 2x, & \text{if } x \text{ is irrational} \end{cases}$

(D) $f(x) = \begin{cases} x, & \text{if } x \text{ is rational} \\ -x, & \text{if } x \text{ is irrational} \end{cases}$

---

38. If the vectors $\begin{pmatrix} 1 \\ -1 \\ 3 \end{pmatrix}, \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix}, \begin{pmatrix} p \\ 0 \\ 1 \end{pmatrix}$ are linearly dependent, then the value of p is:

(A) 2
(B) 4
(C) 1
(D) 6

---

39. If $\vec{F}$ is a vector point function and ϕ is a scalar point function, then match List-I with List-II and choose the correct option:

LIST-I	**LIST-II**
A. div (grad ϕ)	**I.** $\frac{1}{2}\nabla F^2 - (\vec{F} \cdot \nabla)\vec{F}$
B. curl (grad ϕ)	**II. grad(div $\vec{F}$)** $- \nabla^2 \vec{F}$
C. $\vec{F} \times$ curl $\vec{F}$	**III.** $\vec{0}$
D. curl (curl $\vec{F}$)	**IV.** $\nabla \cdot \nabla\phi$

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

---

40. The value of integral $\oint_C \frac{z^3 - z}{(z - z_0)^3} dz$, where z_0 is outside the closed curve C described in the positive sense, is

(A) 1
(B) 0
(C) $-\frac{8\pi i}{3}e^{-2}$
(D) $\frac{2\pi i}{3}e^{2}$

---

41. The solution of the differential equation $(x^2-4xy-2y^2)dx+(y^2-4xy-2x^2)dy=0$, is

(A) $x^3+6x^2y-6xy^2-y^3+C=0$
(B) $x^3-6x^2y-6xy^2+y^3+C=0$
(C) $x^3-6x^2y-6xy^2-y^3+C=0$
(D) $x^3+6x^2y+6xy^2+y^3+C=0$

---

42. If $x\in\mathbb{R}$ and a particular integral (P.I.) of $(D^2-2D+4)y=e^x\sin x$ is $\frac{1}{2}e^xf(x)$, then $f(x)$ is:

(A) an increasing function on $[0,\pi]$
(B) a decreasing function on $[0,\pi]$
(C) a continuous function on $[-2\pi,2\pi]$
(D) not differentiable function at $x=0$

---

43. The value of $\int_0^{\pi}\frac{x\sin x}{1+\cos^2 x}dx$ is:

(A) $\frac{\pi^2}{2}$
(B) $\frac{\pi^2}{4}$
(C) $\frac{\pi^2}{6}$
(D) $\frac{\pi^2}{8}$

---

44. The orthogonal trajectory of the cardioid $r=a(1-\cos\theta)$, where 'a' is an arbitrary constant is:

(A) $r=b(1+\cos\theta)$, where b is an arbitrary constant
(B) $r=b(1-\cos\theta)$, where b is an arbitrary constant
(C) $r=b(1+\sin\theta)$, where b is an arbitrary constant
(D) $r=b(1-\sin\theta)$, where b is an arbitrary constant

---

45. If $\vec{F}$ be the force and C is a non-closed arc, then $\int_C \vec{F} \cdot d\vec{r}$ represents:

(A) Flux
(B) Circulation
(C) Work done
(D) Conservative field

---

46. In Green's theorem, $\oint_C (x^2y dx + x^2 dy) = \iint_R f(x,y) dx dy$, where C is the boundary described counter clockwise of the triangle with vertices (0, 0), (1, 0), (1, 1) and R is the region bounded by a simple closed curve C in the x-y plane, then $f(x,y)$ is equal to:

(A) $x - x^2$
(B) $2x - x^2$
(C) $y - x^2$
(D) $2y - x^2$

---

47. The value of $\int_0^{1+i} (x^2 - iy) dz$, along the path $y = x^2$ is:

(A) $\frac{5}{6} - \frac{1}{6}i$
(B) $\frac{5}{6} + \frac{1}{6}i$
(C) $\frac{1}{6} - \frac{5}{6}i$
(D) $\frac{1}{6} + \frac{5}{6}i$

---

48. Let $f : \mathbb{R} \times \mathbb{R} \to \mathbb{R}$ be defined as $f(x,y) = \begin{cases} \frac{x}{\sqrt{x^2+y^2}} & ; (x,y) \neq (0,0) \\ 1 & ; (x,y) = (0,0) \end{cases}$, then which of the following statement is true?

(A) $\lim_{(x,y)\to(0,0)} f(x,y)$ does not exist
(B) $f(x,y)$ is continuous but not differentiable
(C) $f(x,y)$ is differentiable function
(D) $f(x,y)$ have removable discontinuity

---

49. The system of linear equations $x + y + z = 6$, $x + 2y + 5z = 10$, $2x + 3y + \lambda z = \mu$ has a unique solution, if

(A) $\lambda \neq 16, \mu = 6$
(B) $\lambda = 6, \mu = 16$
(C) $\lambda = 6, \mu \neq 16$
(D) $\lambda \neq 6, \mu \in \mathbb{R}$

---

50. For the given linear programming problem,
Minimum Z = 6x + 10y
subject to the constraints
$x \geq 6$; $y \geq 2$; $2x + y \geq 10$; $x, y \geq 0$,
the redundant constraints are:

(A) $x \geq 6, 2x + y \geq 10$
(B) $2x + y \geq 10$
(C) $x \geq 6, y \geq 2, x \geq 0, y \geq 0$
(D) $y \geq 2, x \geq 0$

---

51. Which of the following statements are true for group of permutations?
A. Every permutation of a finite set can be written as a cycle or a product of disjoint cycles
B. The order of a permutation of a finite set written in a disjoint cycle form is the least common multiple of the lengths of the cycles
C. If A_n is a group of even permutation of n-symbol $(n > 1)$, then the order of A_n is n!
D. The pair of disjoint cycles commute

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

---

52. A ring (R, +, .), where all elements are idempotent is always:

(A) a commutative ring
(B) not an integral domain
(C) a field
(D) an integral domain with unity

---

53. If $v = \sin^{-1}\left(\frac{x^{1/3}+y^{1/3}}{x^{1/2}+y^{1/2}}\right)$, then $x\frac{\partial v}{\partial x} + y\frac{\partial v}{\partial y}$ is equal to :

(A) $\frac{12}{\tan v}$
(B) $\frac{1}{12}\tan v$
(C) $-\frac{1}{12}\tan v$
(D) $\frac{-12}{\tan v}$

---

54. Let D be the region bounded by a closed cylinder $x^2 + y^2 = 16$, $z = 0$ and $z = 4$, then the value of $\iiint_D (\nabla \cdot \vec{v}) dV$, where $\vec{v} = 3x^2\hat{\imath} + 6y^2\hat{\jmath} + z\hat{k}$, is:

(A) 64π
(B) 128π
(C) $\frac{64\pi}{3}$
(D) 48π

---

55. The value of the double integral $\iint_R e^{x^2} dxdy$, where R is a region given by $2y \leq x \leq 2$ and $0 \leq y \leq 1$, is:

(A) $(e^4 - 1)$
(B) $\frac{1}{4}(e^4 - 1)$
(C) $\frac{1}{4}(e^4 + 1)$
(D) $\frac{1}{2}(e^4 - 1)$

---

56. Let A be a 2×2 matrix with $\det(A) = 4$ and trace$(A) = 5$. Then the value of trace(A^2) is:

(A) 10
(B) 13
(C) 17
(D) 18

---

57. A complete solution of $y'' + a_1 y' + a_2 y = 0$ is $y = b_1 e^{-x} + b_2 e^{-3x}$, where a_1, a_2, b_1 and b_2 are constants, then the respective values of a_1 and a_2 are:

(A) 3, 3
(B) 3, 4
(C) 4, 3

(D) 4, 4

---

58. If 'a' is an imaginary cube root of unity, then $(1-a+a^2)^5+(1+a-a^2)^5$ is equal to:

(A) 4
(B) 5
(C) 32
(D) 16

---

59. The solution of the differential equation $xdy - ydx = (x^2 + y^2)dx$, is

(A) $y = \tan(x + c)$; where c is an arbitrary constant
(B) $x = y\tan(x + c)$; where c is an arbitrary constant
(C) $y = x\tan^{-1}(y + c)$; where c is an arbitrary constant
(D) $y = x\tan(x + c)$; where c is an arbitrary constant

---

60. The value of $\iiint_E \frac{dx\,dy\,dz}{x^2+y^2+z^2}$, where E: $x^2 + y^2 + z^2 \leq a^2$, is

(A) πa
(B) $2\pi a$
(C) $4\pi a$
(D) $8\pi a$

---

61. The given series $1 - \frac{1}{2^p} + \frac{1}{3^p} - \frac{1}{4^p} + \ldots (p > 0)$ is conditionally convergent, if 'p' lies in the interval:

(A) $(0, 1]$
(B) $[0, 1]$
(C) $(1, \infty)$
(D) $[1, \infty)$

---

62. Which of the following set of vectors forms the basis for $\mathbb{R}^3$?

(A) $S = \{(1, 1, 1), (1, 0, 1)\}$
(B) $S = \{(1, 1, 1), (1, 2, 3), (2, -1, 1)\}$

(C) $S = \{(1,2,3),(1,3,5),(1,0,1),(2,3,0)\}$
(D) $S = \{(1,1,2),(1,2,5),(5,3,4)\}$

---

63. If p is a prime number and O(G) denotes the order of a group G and p divides O(G), then group G has an element of order p. Then, this is a statement of

(A) Lagrange's Theorem
(B) Sylow's Theorem
(C) Euler's Theorem
(D) Cauchy's Theorem

---

64. If U and W are distinct 4-dimensional subspaces of a vector space V of dimension 6, then the possible dimensions of $U \cap W$ is:

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

---

65. Which of the following forms a linear transformation:

(A) $T : \mathbb{R}^2 \to \mathbb{R}, T(x,y) = xy$
(B) $T : \mathbb{R}^2 \to \mathbb{R}^3, T(x,y) = (x+1, 2y, x+y)$
(C) $T : \mathbb{R}^3 \to \mathbb{R}^2, T(x,y,z) = (|x|, 0)$
(D) $T : \mathbb{R}^2 \to \mathbb{R}^2, T(x,y) = (x+y, x)$

---

66. Let $f(x) = |x| + |x-1| + |x+1|$ be a function defined on $\mathbb{R}$, then $f(x)$ is:

(A) differentiable for all $x \in \mathbb{R}$
(B) differentiable for all $x \in \mathbb{R}$ other than $x = -1, 0, 1$
(C) differentiable only for $x = -1, 0, 1$
(D) not differentiable at any real point

---

67. Let $f(x)$ be a real valued function defined for all $x \in \mathbb{R}$, such that $|f(x) - f(y)| \leq (x-y)^2$, for all $x, y \in \mathbb{R}$, then

(A) $f(x)$ is nowhere differentiable
(B) $f(x)$ is a constant function
(C) $f(x)$ is strictly increasing function in the interval [0,1]
(D) $f(x)$ is strictly increasing function for all $x \in \mathbb{R}$

---

68. The value of the integral $\int_0^\infty \int_0^x xe^{-x^2/y} dy\, dx$ is:

(A) 1
(B) $\frac{3}{2}$
(C) 0
(D) $\frac{1}{2}$

---

69. If, $u = y^3 - 3x^2y$ be a harmonic function then its corresponding analytic function $f(z)$, where $z = x + iy$, is:

(A) $f(z) = z^2 + C$; where C is an arbitrary constant
(B) $f(z) = i(z^2 + C)$; where C is an arbitrary constant
(C) $f(z) = z^3 + C$; where C is an arbitrary constant
(D) $f(z) = i(z^3 + C)$; where C is an arbitrary constant

---

70. The value of v_3 for which the vector $\vec{v} = e^y \sin x\hat{i} + e^y \cos x\hat{j} + v_3\hat{k}$ is solenoidal, is:

(A) $2ze^y \cos x$
(B) $-2ze^y \cos x$
(C) $-2e^y \cos x$
(D) $2e^y \sin x$

---

71. The value of the integral $\iint_R (x + y)\, dy\, dx$ in the region R bounded by $x = 0, x = 2, y = x, y = x + 2$, is

(A) 3
(B) 8
(C) 12
(D) 16

---

72. For any Linear Programming Problem (LPP), choose the correct statement:
A. There exists only finite number of basic feasible solutions to LPP
B. Any convex combination of k - different optimum solution to a LPP is again an optimum solution to the problem
C. If a LPP has feasible solution, then it also has a basic feasible solution
D. A basic solution to AX = b is degenerate if one or more of the basic variables vanish

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

---

73. Which of the following are correct:
A. Every infinite bounded set of real number has a limit point
B. The set $S = \{x : 0 < x \leq 1, x \in \mathbb{R}\}$ **is a closed set**
C. The set of whole real numbers is open as well closed set
D. The set $S = \{1, -1, \frac{1}{2}, -\frac{1}{2}, \frac{1}{3}, -\frac{1}{3}, \dots\}$ **is neither open set nor closed set**

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

---

74. Match List-I with List-II and choose the correct option:

LIST-I (Function)	**LIST-II (Expansion)**
A. $\log(1-x)$	**I.** $1 + \frac{1}{3} + \frac{1}{6} + \frac{3}{40} + \frac{15}{336} + \dots$
B. $\sin^{-1} x$	**II.** $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \dots$
C. $\log 2$	**III.** $x + \frac{1}{2}\frac{x^3}{3} + \frac{1 \cdot 3}{2 \cdot 4}\frac{x^5}{5} + \frac{1 \cdot 3 \cdot 5}{2 \cdot 4 \cdot 6}\frac{x^7}{7} + \dots, -1 < x \leq 1$
D. $\frac{\pi}{2}$	**IV.** $-x - \frac{x^2}{2} - \frac{x^3}{3} - \dots, -1 \leq x < 1$

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

---

75. The locus of point z which satisfies $\arg\left(\frac{z-1}{z+1}\right) = \frac{\pi}{3}$ **is:**

(A) $x^2 + y^2 - 2y + 1 = 0$
(B) $3x^2 + 3y^2 + 10x + 3 \geq 0$

(C) $3x^2 + 3y^2 + 10x + 3 = 0$
(D) $x^2 + y^2 - \frac{2}{\sqrt{3}}y - 1 = 0$
