CET(PG)-2015

Sr. No. : 203388

Question Booklet Series : A

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

Roll No. *In Figures* *In Words*

O.M.R. Answer Sheet Serial No.

Signature of the Candidate :

Subject : Mathematics

Time : 90 minutes **Number of Questions : 75** **Maximum Marks : 75**

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

INSTRUCTIONS

1. Write your Roll No. on the Question Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Subject and Series Code of Question Booklet on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Ball Point / Black Gel pen.**
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. To open the Question Booklet remove the paper seal gently when asked to do so.
5. Please check that this Question Booklet contains **75** questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of test.
6. Each question has four alternative answers (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 Ball Point / Black Gel pen.**
7. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Sheet. No marks will be deducted in such cases.
8. Darken the bubbles in the OMR Answer Sheet according to the Serial No. of the questions given in the Question Booklet.
9. Negative marking will be adopted for evaluation i.e., 1/4th of the mark of the question will be deducted for each wrong answer. A wrong answer means incorrect answer or wrong filling of bubble.
10. For calculations, use of simple log tables is permitted. Borrowing of log tables and any other material is not allowed.
11. For rough work only the sheets marked "Rough Work" at the end of the Question Booklet be used.
12. 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.**
13. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
14. 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.
15. 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.
16. **Telecommunication equipment such as pager, cellular phone, wireless, scanner, etc., is not permitted inside the examination hall. Use of calculator is not allowed.**

1. **Which of the following sets has the least upper bound property ?**

(A) The set of all rationals

(B) The set of all irrationals

(C) The set of all positive irrational numbers

(D) The set of integers

2. **Let** $f(x) = \begin{cases} x \sin(1/x) & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$ **then :**

(A) f(x) is continuous but not differentiable at $x = 0$

(B) f(x) is differentiable at $x = 0$

(C) f(x) is not continuous at $x = 0$ but $\lim_{x\to 0} f(x)$ exists

(D) $\lim_{x\to 0} f(x)$ does not exist

3. **The number of real roots of** $f(x) = x(x^2 - 4)(x^2 + 4) + 2$ **is :**

(A) 0

(B) 1

(C) 3

(D) 5

4. **The tangent to the curve** $f(x) = x^2 - 3x + 2$ **at the point (c, f(c)) is parallel to the line joining the points (0, f(0) and (1, f(1)) for :**

(A) $c = 1/2$

(B) $c = 1/3$

(C) $c = 1/4$

(D) $c = 1/5$

5. **The curvature of the curve** $r(t) = (a\cos(t), a\sin(t))$ **at t is :**

(A) a

(B) 1/a

(C) 1

(D) t/a

6. **What does the curve $r(t) = (t \cos(t), t \sin(t))$, $t \in [0, 100]$, represent :**

(A) A clockwise moving circle

(B) An anti-clockwise moving circle

(C) A clockwise moving spiral

(D) An anti-clockwise moving spiral

7. **The volume of the solid formed by rotating the area between the curves of $f(x)$ and $g(x)$ and the lines $x = a$ and $x = b$ about the x-axis is given by :**

(A) $V = \pi \int_a^b |f^2(x) - g^2(x)| \, dx$

(B) $V = \pi \int_a^b |f^2(x) + g^2(x)| \, dx$

(C) $V = 2\pi \int_a^b |f^2(x) - g^2(x)| \, dx$

(D) $V = 2\pi \int_a^b |f^2(x) + g^2(x)| \, dx$

8. **The polar form of the complex number $z = 1 - i$ is :**

(A) $z = \sqrt{2}(\cos(\pi/4) + i \sin(\pi/4))$

(B) $z = \sqrt{2}(\cos(-\pi/4) + i \sin(-\pi/4))$

(C) $z = \sqrt{2}(\cos(\pi/3) + i \sin(\pi/3))$

(D) $z = \sqrt{2}(-\cos(\pi/3) + i \sin(-\pi/3))$

9. **Which of the following holds ?**

(A) $\cos(5\theta) = 16 \cos^5(\theta) - 20 \cos^3(\theta) + 5 \cos(\theta)$

(B) $\cos(5\theta) = 16 \cos^5(\theta) + 20 \cos^3(\theta) + 5 \cos(\theta)$

(C) $\cos(5\theta) = 16 \cos^5(\theta) - 20 \cos^3(\theta) - 5 \cos(\theta)$

(D) $\cos(5\theta) = 16 \cos^5(\theta) + 20 \cos^3(\theta) - 5 \cos(\theta)$

10. **GCD of $x^3 + x^2 + x + 1$ and $x^4 - 2x^2 - 3$ is :**

(A) $x + 1$

(B) $x - 1$

(C) $x^2 + 1$

(D) $x^2 - 1$

11. **What will be the remainder on dividing $5x^{99} + 3x^{90} - 7x^{81} + 2x^{12} - x + 1$ by $x - 1$?**

(A) 0

(B) 1

(C) 2

(D) 3

12. **What are the possible degrees of irreducible polynomials over $\mathbb{R}$?**

(A) All positive integers
(B) All odd positive integers
(C) All even positive integers
(D) 1 and 2

13. **What are the possible degrees of irreducible polynomials over $\mathbb{C}$?**

(A) All positive integers
(B) All odd positive integers
(C) 1
(D) 1 and 2

14. **The number of positive real roots of the polynomial $x^5 + 2x^4 - 5x^3 + 8x^2 - 7x - 3$ is :**

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

15. **The number of real roots of the polynomial $x^5 + px + q$, where p and q are positive real numbers, is :**

(A) 1
(B) 3
(C) 5
(D) 0

16. **Eigen values of a Hermitian matrix are :**

(A) Reals
(B) Purely imaginary
(C) Rationals
(D) Integers

17. **Let A, P, Q be $n \times n$ matrices over $\mathbb{C}$ such that P and Q are invertible. Then which of the following is true ?**

(A) A and PAQ have the same eigen values
(B) If A is Hermitian then so is PAQ
(C) If A is skew-Hermitian, then so is PAQ
(D) If A is invertible, then so is PAQ

18. **Let X be an $n \times n$ matrix over $\mathbb{C}$ which has n distinct eigen values. The which of the following is correct ?**

(A) X is invertible

(B) X is symmetric

(C) X is Hermitian

(D) X is diagonalizable

19. **Let A be an $n \times n$ matrix of rank r over $\mathbb{R}$. The number of linearly independent solutions of the matrix equation $AX = 0$ is equal to :**

(A) r

(B) $n - r$

(C) n

(D) At the most r

20. **Let A be an $n \times n$ of rank r and B be an $n \times 1$ matrix over $\mathbb{R}$. Then the matrix equation $AX = B$ has a solution if :**

(A) $r < n$

(B) A is a symmetric matrix

(C) A is a diagonal matrix

(D) $r = n$

21. **Which of the following is not true ?**

(A) The set $\left\{ \begin{pmatrix} a & a \\ a & a \end{pmatrix} : \text{a is a nonzero element of } \mathbb{R} \right\}$ is a group under multiplication

(B) If every subgroup of a group G is normal, then G is abelian

(C) Every group of order 6 has a subgroup of order 3

(D) Every group of order 6 has a normal subgroup

22. **Which of the following is not true about a subgroup H of a finite group G ?**

(A) The number of left cosets of H in G is equal to the number of the right cosets of H in G

(B) The number of left cosets of H in G equal to the number of the right cosets of H in G only when H is a normal subgroup of G

(C) G is equal to the union of all left cosets of H in G

(D) The number of elements in every right coset of H in G is equal to the number of elements in every left coset of H in G

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23. **How many conjugacy classes does S_3 have ?**

(A) 2 (B) 3

(C) 4 (D) 6

24. **Which of the following numbers is an order of an element of S_5 ?**

(A) 6 (B) 10

(C) 12 (D) 20

25. **Let $R = \left\{ \begin{pmatrix} a & a \\ a & a \end{pmatrix} : a \in \mathbb{R} \right\}$. Then which of the following is not true ?**

(A) R is a ring without identity (B) R is a ring with identity

(C) R is an integral domain (D) R is a field

26. **$\mathbb{Z}[x]/x\mathbb{Z}[x]$ is :**

(A) An integral domain but not a field (B) A ring which is not a domain

(C) A field (D) A ring without identity

27. **Let $R = \mathbb{Z} \times \mathbb{Z}$ and $I = \{(x, 0) : x \in \mathbb{Z}\}$. Then :**

(A) I is a prime ideal of R which is not maximal

(B) I is a maximal ideal of R

(C) I is a subring of R but not an ideal

(D) I is an ideal which is not prime

28. Let V be a two dimensional vector space over $\mathbb{R}$. Then the number of subspaces of V is :

(A) Countable

(B) 2

(C) 3

(D) Uncountable

29. Which of the following is not a subspace of the Euclidean plane $\mathbb{R}^2$ considered as a vector space over $\mathbb{R}$?

(A) x-axis

(B) y-axis

(C) The line $x + y = 1$

(D) The line $x + y = 0$

30. Let $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be defined as $T(x, y) = (x, x)$. Then :

(A) T is not a linear transformation

(B) T is a one-to-one linear transformation

(C) T is an onto linear transformation

(D) T is a linear transformation which is not onto

31. Let T be a linear transformation of a finite dimensional vector space over $\mathbb{R}$. Then :

(A) Every characteristic value of T has algebraic multiplicity one

(B) Every characteristic value of T has geometric multiplicity one

(C) T always has a characteristic value in $\mathbb{R}$

(D) T may not have any characteristic value in $\mathbb{R}$

32. Which of the following sets is countable ?

(A) $\{0.x_1 x_2 x_3 \ldots\ldots\ldots : \text{each } x_i \text{ is either } 0 \text{ or } 1\}$

(B) $\{(x, y) \in \mathbb{R}^2 : x, y \in \mathbf{Q}\}$

(C) All the points on y-axis

(D) All the points in a circle with positive radius in $\mathbb{R}^2$

33. Let $f : \mathbb{R} \to \mathbb{R}$ be a continuous odd function. Then $\int_{-n}^{n} f dx$ for any positive integer :

(A) May not exist

(B) Is a positive integer

(C) Is 0

(D) May be negative

34. Which of the following is not correct for a real valued function defined on [a, b] ?

(A) If $\int_a^b f dx$ exists, then f is continuous on [a,b]

(B) If f is continuous on [a, b], then $\int_a^b f dx$ exists

(C) $\int_a^b f dx$ exists only when f is bounded on [a, b]

(D) If f is positive and continuous, then $\int_a^b f dx > 0$

35. Which of the following is true for a continuous positive function defined on $[1, \infty]$?

(A) If f is monotonically decreasing, then $\int_1^{\infty} f dx$ exists

(B) If $\lim_{x\to\infty} f(x) = 0$, then $\int_1^{\infty} f dx$ exists

(C) If $\int_1^{\infty} f dx$ exists, then f is monotonically decreasing

(D) $\int_1^{\infty} f dx$ may not exist even if $\lim_{x\to\infty} f(x) = 0$

36. Which of the following integral exists ?

(A) $\int_1^{\infty} \sin(x)\, dx$

(B) $\int_1^{\infty} \cos(x)\, dx$

(C) $\int_1^{\infty} (1/x)\, dx$

(D) $\int_1^{\infty} e^{-x^2}\, dx$

37. For which of the following sequences $f_1(x)$, $f_2(x)$,........ is not uniformly convergent in [0,1] ?

(A) $f_n(x) = x^n$

(B) $f_n(x) = x^n/n$

(C) $f_n(x) = \cos(x)/n$

(D) $f_n(x) = \sin(x)/n$

38. **Suppose the sequence $f_1(x), f_2(x), \ldots\ldots$ converges uniformly to $f(x)$ in $[a,b]$. Which of the following is not correct ?**

(A) If each f_i is continuous, then f is continuous

(B) If each f_i is differentiable, then f is differentiable

(C) If each f_i is bounded, then f is bounded

(D) If $f_i(x) > 0$ for all i and all $x \in [a,b]$, then $f(x) \geq 0$ for all $x \in [a,b]$

39. **Which of the following series does not converge uniformly in [0, 1] ?**

(A) $\sum_{n=1}^{\infty} \frac{\cos(3^n x)}{2^n}$

(B) $\sum_{n=1}^{\infty} \frac{\cos(3^n x)}{n^2}$

(C) $\sum_{n=1}^{\infty} \frac{\cos(3^n x)}{n^{3/2}}$

(D) $\sum_{n=1}^{\infty} \frac{\cos(3^n x)}{\log(n)}$

40. $\lim_{(x,y)\to(0,0)} \frac{x^2 - xy}{\sqrt{x} - \sqrt{y}}$ is :

(A) Not defined

(B) 0

(C) 1

(D) 2

41. $\lim_{(x,y)\to(0,0)} \frac{2x^2y}{x^4 + y^2}$ is :

(A) Not defined

(B) 0

(C) 1

(D) 2

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42. Let $f(x,y) = \begin{cases} \dfrac{2xy}{x^2+y^2} \text{ if } (x,y) \neq (0,0) \\ 0 \text{ if } (x,y) = (0,0). \end{cases}$ **Then :**

(A) $f(x, y)$ is continuous everywhere

(B) The number of discontinuities of $f(x, y)$ is infinite

(C) The function is discontinuous at x-axis and y-axis

(D) $f(x, y)$ is discontinuous only at $(0,0)$

43. Let $\sum_{n=1}^{\infty}(-1)^n a_n$, where each $a_n \geq 0$, be an alternating series such that $\lim_{n\to\infty} a_n = 0$. Then the series :

(A) Converges to a positive real number

(B) Converges to a negative real number

(C) Converges

(D) May not converge

44. **The slope of the tangent of the curve of intersection of the plane $x = 1$ and the paraboloid $z = x^2 + y^2$ at the point $(1, 2, 5)$ is :**

(A) 1/4

(B) 4

(C) 2

(D) 1

45. **The local extreme values of the function $f(x, y) = x^2 - y^2$ are :**

(A) $(0,0)$ only

(B) All points on the x-axis

(C) All points on the y-axis

(D) The function has no extreme values

46. **The value of $\iint_R (1-6x^2y)\,dA$, where R is the region bounded by $0 \leq x \leq 2$, $-1 \leq y \leq 1$, is :**

(A) 2

(B) 3

(C) 4

(D) 6

47. **The volume of the prism whose base is the triangle in the xy-plane bounded by the x-axis and the lines $y = x$ and $x = 1$ and whose top lies in the plane $z = 3 - x - y$ is :**

(A) 1

(B) 2

(C) 1/2

(D) 3/2

48. **Let D be the region bounded below by the plane $z = 0$, laterally by the circular cylinder $x^2 + (y-1)^2 = 1$ and above by the paraboloid $z = x^2 + y^2$. Then $\iiint_D f(r, \theta, z)\, dV$ in cylindrical coordinates equals :**

(A) $\int_0^{\pi} \int_0^{2\sin(\theta)} \int_0^{r} f(r, \theta, z) dz\, r\, dr\, d\theta$

(B) $\int_0^{\pi} \int_0^{2\sin(\theta)} \int_0^{r^2} f(r, \theta, z) dz\, r\, dr\, d\theta$

(C) $\int_0^{\pi/2} \int_0^{2\sin(\theta)} \int_0^{r^2} f(r, \theta, z) dz\, r\, dr\, d\theta$

(D) $\int_0^{\pi} \int_0^{\sin(\theta)} \int_0^{r^2} f(r, \theta, z) dz\, r\, dr\, d\theta$

49. **In spherical coordinates the volume of the upper region D cut from the solid sphere $\rho \leq 1$ by the cone $\phi = \pi/3$ is :**

(A) $\int_0^{2\pi} \int_0^{\pi/3} \int_0^{1} \rho^2 \sin(\phi)\, d\rho\, d\phi\, d\theta$

(B) $\int_0^{\pi} \int_0^{\pi/3} \int_0^{1} \rho^2 \sin(\phi)\, d\rho\, d\phi\, d\theta$

(C) $\int_0^{2\pi} \int_0^{\pi/2} \int_0^{1} \rho^2 \sin(\phi)\, d\rho\, d\phi\, d\theta$

(D) $\int_0^{2\pi} \int_0^{\pi/4} \int_0^{1} \rho^2 \sin(\phi)\, d\rho\, d\phi\, d\theta$

50. **Consider the function $f(x, y) = \begin{cases} 0 \text{ if } xy \neq 0 \\ 1 \text{ if } xy = 0 \end{cases}$. Then which of the following is correct ?**

(A) $\lim_{(x,y) \to (0,0)} f(x,y)$ exists

(B) The partial derivatives f_x and f_y exist at (0,0)

(C) $f(x, y)$ is continuous at (0, 0)

(D) The partial derivatives f_x and f_y do not exist at (0,0)

51. **The equation $8x^2 - 4xy + 5y^2 - 16x - 14y + 17 = 0$ represents :**

(A) Parabola (B) Hyperbola

(C) A pair of straight lines (D) An ellipse

52. **The spheres $x^2 + y^2 + z^2 = 64$ and $x^2 + y^2 + z^2 - 12x + 4y - 6z + 48 = 0$:**

(A) Intersect at two points (B) Touch externally

(C) Touch internally (D) Do not meet at any point

53. **The equation of the tangent plane at (1, 2, 3) to the sphere $x^2 + y^2 + z^2 = 16$ is :**

(A) $x + 2y + 3z = 0$ (B) $x + y + z = 16$

(C) $x + 2y + 3z = 16$ (D) $x + y + z = 0$

54. **The angle through which the coordinate axes should be rotated so that the product term (xy) in the equation $x^2 + 4xy + 4y^2 - 3x = 6$, disappears is given by :**

(A) $\tan^{-1} 2$ (B) $\tan^{-1} (1/2)$

(C) $\tan^{-1} (3)$ (D) $\sin^{-1} (2)$

55. **Generators of the cylinder $y^2 + z^2 = 2ay$ are :**

(A) Parallel to z-axis (B) Parallel to x-axis

(C) Pass through origin (0, 0, 0) (D) Pass through the point (0, a, 0)

56. **The equation of the reciprocal cone of $x^2 + y^2 + 2z^2 = 0$ is :**

(A) $2x^2 + 2y^2 + z^2 = 0$ (B) $x^2 + y^2 + 2z^2 = 0$

(C) $x^2 + y^2 + \frac{z^2}{2} = 1$ (D) $2x^2 + 2y^2 + z^2 = 1$

57. **The order of the differential equation whose general solution is $y = (c_1 + c_2)\cos(x + c_3) - c_4 e^{x+c_5}$ where c_1, c_2, c_3, c_4, c_5 are arbitrary constants, is :**

(A) 5
(B) 4
(C) 3
(D) 2

58. $\left(\dfrac{2+\sin x}{y+1}\right)\left(\dfrac{dy}{dx}\right) = -\cos x$, **$y(0) = 1$, then $y(\pi/2)$ is equal to :**

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

59. **A solution of the differential equation $y'^2 - xy' + y = 0$ is :**

(A) $y = 2$
(B) $y = 2x$
(C) $y = 2x^2 - 4$
(D) $y = 2x - 4$

60. **Let a, b, c be distinct non-negative numbers. If the vectors $a\hat{i} + a\hat{j} + c\hat{k}$, $\hat{i} + \hat{k}$ and $c\hat{i} + c\hat{j} + b\hat{k}$ lie in a plane then the value of 'c' is :**

(A) The Arithmetic Mean of a and b
(B) The Geometric Mean of a and b
(C) The Harmonic Mean of a and b
(D) Equal to zero

61. **General solution of the differential equation $y = xy' + 2e^{y'}$ is :**

(A) $y = e^c$
(B) $y = cx$
(C) $y = xe^c$
(D) $y = cx + 2e^c$

62. **$2x^2y'' + xy' - 2y = 0$, then $x = 2$ is :**

(A) An ordinary point of the differential equation
(B) A singular point but not regular singular
(C) A regular singular point
(D) Cannot say anything

63. **The value of constant λ s.t.**

$x(\lambda + y^2)\,dx + y(1 + \lambda x^2)dy = 0$ is exact :

(A) $\lambda = 0$

(B) $\lambda = 1$

(C) $\lambda = 2$

(D) λ can be any constant

64. **In which of the following f_1, f_2, f_3 are linearly independent function over all reals ?**

$f_i = f_i(x)$ $1 \leq i \leq 3$:

(A) $f_1(x) = 1$, $f_2(x) = \sin^2 x$, $f_3(x) = \cos^2 x$

(B) $f_1(x) = x$, $f_2(x) = e^x$, $f_3(x) = 2x - e^x$

(C) $f_1(x) = e^x$, $f_2(x) = e^{2x}$, $f_3(x)\ e^{3x}$

(D) $f_1(x) = 2\sin x + \cos x$, $f_2(x) = 2\sin x - \cos x$, $f_3(x) = \cos x$

65. **Three parallel forces $\vec{P}, \vec{Q}, \vec{R}$ are in equilibrium. $\vec{P}$ and $\vec{Q}$ are alike. Then $\vec{R}$ satisfies :**

(A) $R = P + Q$, the direction of $\vec{R}$ is same as that of $\vec{P}$ and $\vec{Q}$

(B) $R = P - Q$, the direction of $\vec{R}$ is same as that of $\vec{P}$ and $\vec{Q}$

(C) $R = P + Q$, the direction of $\vec{R}$ is opposite to that of $\vec{P}$ and $\vec{Q}$

(D) $R = P - Q$, the direction of $\vec{R}$ is opposite to that of $\vec{P}$ and $\vec{Q}$

66. **Two coplanar couples are equivalent, then :**

(A) The forces of one couple must be equal to the forces of the second couple

(B) Moment of one couple must be equal to the moment of the second couple

(C) Arms of the two couples must be same

(D) The two couples must have equal, opposite moments

67. **The amount of work done against friction to slide a box in a straightline across a uniform, horizontal floor depends most on the :**

(A) Time taken to move the box

(B) Distance the box is moved

(C) Speed of the box

(D) The direction of the box's motion

68. A 2.0×10^3 kg car travels at a constant speed of 12 meters per second around a circular curve of radius 30 meters.

What is the magnitude of the centripetal acceleration of the car as it goes around the curve ?

(A) 0.40 m/s^2
(B) 4.8 m/s^2
(C) 800 m/s^2
(D) 9,600 m/s^2

69. An object weighing 15 newtons is lifted from the ground to a height of 0.22 meter. The increase in the object's gravitational potential energy is approximately :

(A) 310 Joules
(B) 32 Joules
(C) 3.3 Joules
(D) 0.34 Joules

70. If the sum of all the forces acting on a moving object is zero, the object will :

(A) Slow down and stop
(B) Change the direction of motion
(C) Accelerate uniformly
(D) Continue moving with constant velocity

71. Laplace transform of sin (at) is :

(A) $\frac{1}{s^2+a^2}$
(B) $\frac{s}{s^2+a^2}$
(C) $a^s/(s^2+a^2)$
(D) a/s^2+a^2

72. Inverse Laplace transform of $\frac{1}{s^2-a^2}$ is :

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

73. **The orthogonal trajectories of the family of curves $x^2 + y^2 = C$ where C is a constant is given by :**

(A) $y^2 = \frac{-x^2}{2} + C$

(B) $y = Cx$

(C) $xy = C^2$

(D) $x^2 - y^2 = C^2$

74. **All the solutions of $y'' + 5y = 0$ are linear combination of :**

(A) $e^{5x}\ e^{-5x}$

(B) $e^{\sqrt{5x}}, e^{-\sqrt{5x}}$

(C) $\cos\sqrt{5}x, \sin\sqrt{5}\,x$

(D) $\cos h\sqrt{5}x, \sin h\sqrt{5}\,x$

75. **In Euler's method, given the initial value problem $y' = \frac{dy}{dx} = f(x,y)$, $y(x_o) = y_0$. Then the approximation is given by :**

(A) $y_{n+1} = y_n + h\, f(x_{n-1}, y_{n-1})$

(B) $y_{n+1} = y_n + h\, f(x_n, y_n)$

(C) $y_{n+1} = y_n + h\, f(x_{n-1}, y_n)$

(D) $y_{n+1} = y_n + h\, f(x_n, y_{n-1})$