# TEST PAPER 1

**Total Questions: 75** **Time allotted 90 minutes**

1. The set of all integers x such that |x – 3| < 2 is equal to
(a) {1, 2, 3, 4, 5} (b) {1, 2, 3, 4}
(c) {2, 3, 4} (d) {-4, -3, -2}

2. The Range of the function f(x) = $\frac{x-2}{2-x}$ is
(a) R (b) R – {1}
(c) (-1) (d) R – {-1}

3. The value of $(i)^i$ is
(a) ω (b) $\omega^2$
(c) $e^{-\pi/2}$ (d) $2\sqrt{2}$

4. $\frac{(\cos\theta + i\sin\theta)^4}{(i\cos\theta + \sin\theta)^5}$ is equal to
(a) $\cos - i\sin\theta$ (b) $\cos 9\theta - i\sin 9\theta$
(c) $\sin\theta - i\cos\theta$ (d) $\sin 9\theta - i\cos 9\theta$

5. The roots of the quadratic equation $ax^2 + bx + c = 0$ will be reciprocal to each other if
(a) a = 1/c (b) a = c
(c) b = ac (d) a = b

6. If α, β are the roots of $ax^2 - 2bx + c = 0$ then $\alpha^3\beta^3 + \alpha^2\beta^3 + \alpha^3\beta^2$ is
(a) $\frac{c^2(c+2b)}{a^3}$ (b) $\frac{bc^3}{a^3}$
(c) $\frac{c^2}{a^3}$ (d) None of these

7. The sixth term of a HP is 1/61 and the $10^{th}$ term is 1/105. The first term of the H.P. is
(a) 1/39 (b) 1/28
(c) 1/17 (d) 1/6

8. Let $S_n$ denote the sum of first n terms of an A.P.. If $S_{2n} = 3S_n$, then the ratio $S_{3n} / {}_{5n}$ is equal to
(a) 4 (b) 6
(c) 8 (d) 10

9. Solution of |3 – x| = x – 3 is
(a) x < 3 (b) x > 3
(c) $x \geq 3$ (d) $x \leq 3$

10. If the product of n positive numbers in 1, then their sum is
(a) a positive integer (b) divisible by n
(c) equal to $n + \frac{1}{n}$ (d) never less than n

11. A lady gives a dinner party to six quests. The number of ways in which they may be selected from among ten friends, if two of the friends will not attend the party together is

(a) 112 (b) 140
(c) 164 (d) None of these

12. For $1 \le r \le n$, the value of $nCr + {}^{n-1}C_r + {}^{n-2}C_r + \_\_\_ + {}^{r}C_r$ is

(a) $nC_{r+1}$ (b) ${}^{n+1}C_r$
(c) ${}^{n+1}C_{r+1}$ (d) None of them.

13. $2.4^{2n+1} + 3^{3n+1}$ is divisible by

(a) 2 (b) 9
(c) 11 (d) 27

14. If $P_n$ denotes the product of the binomial coefficients in the expansions of $(1 + x)^n$, the $\frac{P_{n+1}}{P_n}$ equals

(a) $\frac{n+!}{n!}$ (b) $\frac{n^n}{n!}$
(c) $\frac{(n+1)^{n+1}}{n!}$ (d) $\frac{(n+1)^{n+1}}{(n+1)^!}$

15. If x is very large and n is a negative integer or a proper fraction, then an approximate value of $\left(\frac{1+x}{x}\right)^n$ is

(a) $1+\frac{x}{n}$ (b) $1+\frac{n}{x}$
(c) $1+\frac{1}{x}$ (d) $n\left(1+\frac{1}{x}\right)$

16. If 4 $\log_9 3$ + 9 $\log_2 4$ = $10^{\log}$ x 83, $(x \in R)$

(a) 4 (b) 9
(c) 10 (d) None of these

17. The sum of the series $\log_4^2 - \log_8^2 + \log_{16}^2 \_\_\_\_ \mathit{to} \infty \mathit{is}$

(a) $e^2$ (b) $\log_e 2 + 1$
(c) $\log_e 3 - 2$ (d) $1 - \log_e 2$

18. tan 5x tan 3x tan2x is equal to

(a) $\tan 5x - \tan 3x - \tan 2x$ (b) $\frac{\sin 5x - \sin 3x - \sin 2x}{\cos 5x - \cos 3x - \cos 2x}$
(c) 0 (d) None of these

19. If a = $\tan 6^0 \tan 42^0$ and B = $\cot 66^0 \cot 78^0$

(a) A = 2B (b) $A = \frac{1}{3}B$
(c) A = B (d) 3A = 2B.

20. The value of $\cos\frac{2\pi}{7} + \cos\frac{4\pi}{7} + \cos\frac{6\pi}{7}$ is

(a) 1 (b) -1
(c) 1/2 (d) -1/2

21. If $\tan\alpha = \frac{1}{7} \text{and} \sin\beta = \frac{1}{\sqrt{10}}$, where $0 < \alpha, \beta < \frac{\pi}{2}$, then $2\beta$ is equal to

(a) $\frac{\pi}{4}-\alpha$ (b) $\frac{3\pi}{4}-\alpha$

(c) $\frac{\pi}{8}-\alpha$ (d) $\frac{3\pi}{8}-\frac{\pi}{2}$

22. If $\sin\theta+\cos\theta=\sqrt{2}\sin\theta$, then

(a) $\sqrt{2}\cos\theta$ (b) $-\sqrt{2}\sin\theta$

(c) $-\sqrt{2}\cos\theta$ (d) None of these

23. Value of $\frac{\sin^2 20^0+\cos^4 20^0}{\sin^4 20^0+\cos^2 20^0}$ is

(a) 1 (b) 2

(c) ½ (d) None of these

24. Value of $32\cos^6 20^0-48\cos^4 20^0+18\cos^2 20^0-1$ is

(a) $-1/2$ (b) $1/2$

(c) $\sqrt{3}/2$ (d) None of these

25. If $\sin\theta+\operatorname{cosec}\theta=2$, then value of $\sin^3\theta+\operatorname{cosec}^3\theta$ is

(a) 2 (b) 4

(c) 6 (d) 8

26. If $\operatorname{cosec}\theta+\cot\theta=5/2$, then the value of tanθ is

(a) $15/16$ (b) $21/20$

(c) $15/21$ (d) $20/21$

27. General value of x satisfying the equation $\sqrt{3}\sin x+\cos x=\sqrt{3}$ is given by

(a) $n\pi\pm\frac{\pi}{6}$ (b) $n\pi+(-1)^n\frac{\pi}{4}+\frac{\pi}{3}$

(c) $n\pi\pm\frac{\pi}{3}$ (d) $n\pi+(-1)^n\frac{\pi}{3}-\frac{\pi}{6}$

28. If length of the sides AB, BC and CA of a triangle are 8cm, 15 cm and 17 cm respectively, then length of the angle bisector of ∠ABC is

(a) $\frac{120\sqrt{2}}{23}$cm (b) $\frac{60\sqrt{2}}{23}$cm

(c) $\frac{30}{23}\sqrt{2}$cm (d) None of these

29. A man from the top of a 100 metre high tower sees a car moving towards the tower at an angle of depression of $30^0$. After sometimes, the angle of depression becomes $60^0$. The distance (in metres) traveled by the car during this time is

(a) $100\sqrt{3}$ (b) $\frac{200\sqrt{3}}{3}$

(c) $\frac{100\sqrt{3}}{3}$ (d) $200\sqrt{3}$

30. The shadow of a tower of height $\left(1+\sqrt{3}\right)$ metre standing on the ground is found to be 2 metre longer when the sun's elevation is $30^0$, then when the sun's elevation was

(a) $30^0$ (b) $45^0$

(c) $60^0$ (d) $75^0$

31. $\cos^{-1}\left(\cos\frac{5\pi}{4}\right)$ is equal to

(a) $-\pi/4$ (b) $\pi/4$

(c) $3\pi/4$ (d) $5\pi/4$

32. If $\cos^{-1}\frac{x}{2}+\cos^{-1}\frac{y}{3}=\frac{\pi}{6}$, then value of $\frac{x^2}{4}-\frac{xy}{2\sqrt{3}}+\frac{y^2}{9}$ is

(a) $3/4$ (b) $1/2$

(c) $1/4$ (d) None of these

33. The distance between the lines 4x + 3y = 11 and 8x + 6y = 15 is

(a) 7/2 (b) 7/3

(c) 7/5 (d) 7/10

34. The straight lines x + y – 4 = 0, 3x + y – 4 = 0, x + 3y – 4 = 0 form a traigle which is

(a) isosceles (b) right angled

(c) equilateral (d) None of these

35. Incentre of the triangle whose vertices are (6, 0) (0, 6) and (7, 7) is

(a) $\left(\frac{9}{2},\frac{9}{2}\right)$ (b) $\left(\frac{7}{2},\frac{7}{2}\right)$

(c) $\left(\frac{11}{2},\frac{11}{2}\right)$ (d) None of these

36. The area bounded by the curves y = |x| – 1 and y = – |x| + 1 is

(a) 1 (b) 2

(c) $2\sqrt{2}$ (d) 4

37. The coordinates of foot of the perpendicular drawn from the point (2, 4) on the line x + y = 1 are

(a) $\left(\frac{1}{2},\frac{3}{2}\right)$ (b) $\left(\frac{-1}{2},\frac{3}{2}\right)$

(c) $\left(\frac{3}{2},\frac{-1}{2}\right)$ (d) $\left(\frac{-1}{2},\frac{-3}{2}\right)$

38. Three lines 3x + 4y + 6 = 0, $\sqrt{2}x+\sqrt{3}y+2\sqrt{2}=0$ and $4x+7y+8=0$ are

(a) Parallel (b) Sides of a triangles

(c) Concurrent (d) None of these

39. Angle between the pair of straight lines $x^2 - xy - 6y^2 - 2x + 11y - 3 = 0$ is

(a) $45^0$, $135^0$

(b) $\tan^{-1} 2$, $\pi = \tan^{-1} 2$

(c) $\tan^{-1} 3$, $\pi = \tan^{-1} 3$

(d) None of these

40. If a circle passes through the point (a, b) and cuts the circle $x^2 + y^2 = 4$ orthogonally, then locus of its centre is

(a) $2ax + 2by + \left(a^2 + b^2 + 4\right) = 0$

(b) $2ax + 2by - \left(a^2 + b^2 + 4\right) = 0$

(c) $2ax - 2by + \left(a^2 + b^2 + 4\right) = 0$

(d) $2ax - 2by - \left(a^2 + b^2 + 4\right) = 0$

41. Centre of circle whose normals are $x^2 - 2xy - 3x + 6y = 0$ is

(a) $\left(3, \frac{3}{2}\right)$ (b) $\left(\frac{3}{2}, 3\right)$

(c) $\left(-3, \frac{3}{2}\right)$ (d) $\left(-3, \frac{-3}{2}\right)$

42. Centre of a circle is (2, 3). If the line x + y = 1 touches, its equation is

(a) $x^2 + y^2 - 4x - 6y + 4 = 0$

(b) $x^2 + y^2 - 4x - 6y + 5 = 0$

(c) $x^2 + y^2 - 4x - 6y - 5 = 0$

(d) None of these

43. The centre of a circle passing through the points (0, 0), (1, 0) and touching the circle $x^2 + y^2 = 9$ is

(a) $\left(\frac{3}{2}, \frac{1}{2}\right)$ (b) $\left(\frac{1}{2}, \frac{3}{2}\right)$

(c) $\left(\frac{1}{2}, \frac{1}{2}\right)$ (d) $\left(\frac{1}{2}, -2^{1/2}\right)$

44. The line y = mx + 1 is a tangent to the parabola $y^2 = 4x$ if

(a) m = 1 (b) m = 2

(c) m = 3 (d) m = 4

45. The angle between the tangents drawn from the origin to the parabola $y^2 = 4a(x - a)$ is

(a) $90^0$ (b) $30^0$

(c) $\tan^{-1}\left(\frac{1}{2}\right)$ (d) $45^0$

46. The area of the triangle formed by the tangent and the normal to the parabola $y^2 = 4ax$, both drawn at the same end of the latus rectum and the axis of the parabola is

(a) $2\sqrt{2}a^2$ (b) $2a^2$

(c) $4a^2$ (d) None of these

47. The eccentricity of the eclipse $16x^2 + 7y^2 = 112$ is

(a) 4/3 (b) 7/16

(c) $3/\sqrt{17}$ (d) 3/4

48. A common tangent to the circle $x^2 + y^2 = 16$ and an ellipse $\frac{x^2}{49} + \frac{y^2}{4} = 1$ is

(a) $y = x + 4\sqrt{5}$ (b) $y = x + \sqrt{53}$

(c) $y = \frac{2}{11}x + \frac{4\sqrt{4}}{\sqrt{11}}$ (d) None of these

49. If the hyperbolas $x^2 - y^2 = a^2$ and $xy = c^2$ are of equal size, then

(a) $c^2 = 2a^2$ (b) c = 2a

(c) $2c^2 = a^2$ (d) none of these

50. If a circle cuts rectangles hyperbola xy = 1 in the point (xi, yi), i = 1, 2, 3, 4 then

(a) $x_1x_2x_3x_4 = 0$ (b) $y_1y_2y_3y_4 = 1$

(c) $y_1y_2y_3y_4 = 0$ (d) $x_1x_2x_3x_4 = -1$

51. If $\begin{vmatrix} a & b & 0 \\ 0 & a & b \\ b & 0 & a \end{vmatrix}$ = 0 then

(a) a is a cube root of 1 (b) b is a cube root of 1

(c) a/b is a cube root of 1 (d) a/b is a cube roots of -1

52. If $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}=0$, then $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$ is equal to

(a) 0 (b) abc

(c) –abc (d) None of these

53. The determinant $\begin{vmatrix} \cos(\alpha+\beta) & -\sin(\alpha+\beta) & \cos^2 B \\ \sin\alpha & \cos\alpha & \sin\beta \\ -\cos\alpha & \sin\alpha & \cos\beta \end{vmatrix}$ is independent of

(a) $\alpha$ (b) $\beta$

(c) $\alpha$ and $\beta$ (D) Neither $\alpha$ nor $\beta$

54. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, the value of $A^n$

(a) $\begin{bmatrix} 3n & -4n \\ n & n \end{bmatrix}$ (b) $\begin{bmatrix} 2+n & 5-n \\ n & -n \end{bmatrix}$

(c) $\begin{bmatrix} 3^n & (-4)^n \\ 1 & (-1)^n \end{bmatrix}$ (d) None of these

55. The domain of the function $f(x) = \frac{1}{\sqrt{x^2 - 3x + 2}}$ is

(a) $(-\infty,1)\cup(2,\infty)$ (b) $(-\infty,1]\cup[2,\infty)$

(c) $[-\infty,1)\cup(2,\infty]$ (d) (1, 2)

56. Range of function $\frac{\sin(\pi[x^2+1])}{x^4+1}$ is

(a) 0 (b) {0}

(c) [-1, 1] (d) (0, 1)

57. $\lim_{x\to\pi/4} \frac{1-\cot^3 x}{2-\cot x-\cot^3 x}$ is

(a) $11/4$ (b) $3/4$

(c) $1/2$ (d) None of these

58. $\lim_{x\to 0}\sec^{-1}\left(\frac{\sin x}{x}\right)=$

(a) 1 (b) 0

(c) $\pi/2$ (d) Does not exist

59. The function $y=3\sqrt{x}-|x-1|$ is continuous

(a) x < 0 (b) $x \geq 1$

(c) no point (d) None of these

60. The function $f(x)=\begin{cases}0, x \text{ is irrational is}\\ 1, x \text{ is rational}\end{cases}$

(a) continuous at x = 1 (b) discontinuous only at 0

(c) discontinuous only at 0, 1

(d) discontinuous everywhere

61. Let f : R → R be a function defined by f(x) = max. $\{x, x^3\}$. The set of all points where f(x) is not differentiable is

(a) {-1, 1} (b) {-1, 0}

(c) {0, 1} (d) {-1, 0, 1}

62. If the function $f(x)=\begin{cases}(\cos x)^{1/x}, x\neq 0\\ K \quad x=0\end{cases}$ is continuous of x = 0 then value of k is

(a) 1 (b) -1

(c) 0 (d) e

63. $\int \frac{1+x^5}{1+x}dx=$

(a) $1-x+x^2-x^3+x^4+c$ (b) $x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+\frac{x^5}{5}+x$

(c) $(1+x)^5+C$ (d) None of these

64. $\int x|x|dx$

(a) $\frac{x^3}{3}$ (b) $\frac{x^2|x|}{3}$

(c) $\frac{x^2|x|}{2}$ (d) None of these

65. $\int_{-1}^{1}\frac{|x+2|}{x+2}dx=$

(a) 1 (b) 2

(c) 0 (d) -1

66. $\int_{0}^{\pi/2}\log(\tan x)dx$

(a) $\pi/4$ (b) $\pi/2$

(c) 0 (d) 1

67. If a < 0 < b, then $\int_a^b \frac{|x|}{x}dx$

(a) a – b (b) b – a
(c) a + b (d) –a – b

68. $\int_0^2 x^2 |x| dx$

(a) 5/3 (b) 7/3
(c) 8/3 (d) 4/3

69. $\int_0^\pi \frac{x \sin x}{1+\cos^2 x}dx$

(a) $\pi^2/8$ (b) $\pi^2/4$
(c) $\pi^3/8$ (d) $\pi^4/8$

70. The area bounded by curve $y = 4x - x^2$ and x – axis is

(a) $\frac{30}{7}$ sq. units. (b) $\frac{31}{7}$ sq. units.
(c) $\frac{32}{3}$ sq. units. (d) $\frac{34}{3}$ sq. units.

71. The area bounded by the curves y = |x| - 1 and y = -|x| + 1 is

(a) 1 (b) 2
(c) $2\sqrt{2}$ (d) 4

72. The area bounded by the curves $y = x^4 - 2x^3 + x^2 - 3$, the x-axis and the two ordinates corresponding to the points of minimum of this Function is

(a) 91/15 (b) 91/30
(c) 19/30 (d) None of these

73. Degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^5 + \frac{4\left(\frac{d^2y}{dx^2}\right)^3}{\frac{d^3y}{dx^3}} + \frac{d^3y}{dx^3} = x^2 - 1$, then

(a) m = 3, n = 3 (b) m = 3, n = 2
(c) m = 3, n = 5 (d) m = 3, n = 1

74. A solution of the differential equation $\left(\frac{dy}{dx}\right)^2 - x.\frac{dy}{dx} + y = 0$ is

(a) y = 2 (b) y = 2x
(c) $4y = x^2 + c$ (d) $y = 2x^2 - 4$

75. The area (in square units) of the parallelogram whose diagonals are $\vec{a} = \hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} - 3\hat{j} + 4\hat{k}$

(a) $\sqrt{14}$ (b) $2\sqrt{14}$
(c) $2\sqrt{6}$ (d) $\sqrt{38}$

# ANSWER KEYS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | (c) | 16. | (c) | 31. | (c) | 46. | (c) | 61. | (d) |
| 2. | (c) | 17. | (d) | 32. | (c) | 47. | (d) | 62. | (a) |
| 3. | (c) | 18. | (b) | 33. | (d) | 48. | (d) | 63. | (b) |
| 4. | (d) | 19. | (c) | 34. | (a) | 49. | (c) | 64. | (b) |
| 5. | (b) | 20. | (c) | 35. | (a) | 50. | (b) | 65. | (b) |
| 6. | (a) | 21. | (c) | 36. | (b) | 51. | (d) | 66. | (c) |
| 7. | (d) | 22. | (a) | 37. | (b) | 52. | (b) | 67. | (c) |
| 8. | (b) | 23. | (a) | 38. | (c) | 53. | (a) | 68. | (c) |
| 9. | (d) | 24. | (a) | 39. | (d) | 54. | (d) | 69. | (a) |
| 10. | (d) | 25. | (a) | 40. | (b) | 55. | (a) | 70. | (c) |
| 11. | (b) | 26. | (d) | 41. | (a) | 56. | (b) | 71. | (b) |
| 12. | (c) | 27. | (d) | 42. | (b) | 57. | (b) | 72. | (b) |
| 13. | (c) | 28. | (a) | 43. | (d) | 58. | (d) | 73. | (d) |
| 14. | (d) | 29. | (b) | 44. | (a) | 59. | (d) | 74. | (c) |
| 15. | (b) | 30. | (b) | 45. | (a) | 60. | (d) | 75. | (a) |