TEST PAPER 2

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

1. If $\cos ec\theta + \cot\theta = \frac{11}{2}$, then $\tan\theta$ =

   (a) $21/22$ (b) $15/16$

   (c) $44/117$ (d) $117/44$

2. The value of $\tan 1^0 \tan 2^0 \_ \_ \_ \tan 89^0$ is

   (a) 0 (b) 1

   (c) -1 (d) None of these

3. The value of $\cos^2 73^0 + \cos^2 47^0 + \cos 73^0 \cos 47^0$ is

   (a) $1/4$ (b) $-1/4$

   (c) $3/4$ (d) None of these

4. If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$, then the value of A + B is

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

   (c) π (d) $\pi/6$

5. If $\text{cosec}\theta - \cot\theta = \frac{1}{2}, 0 < \theta < \pi/2$, then $\cos\theta$ is equal to

   (a) $5/3$ (b) $3/5$

   (c) $-3/5$ (d) $-5/3$

6. If tan A – tan B = x and cot B – cot A = y, then cot (A – B) =

   (a) $1/x - 1/y$ (b) $1/x + 1/y$

   (c) $1/y - 1/x$ (d) None of these

7. If $\tan^2\theta = 2\tan^2\phi + 1$, then $\cos 2\theta + \sin^2\phi =$

   (a) 0 (b) 1

   (c) 2 (d) None of these

8. If $\cos(A - B) = 3/5$ and $\tan A \tan B = 2$, then

   (a) $\cos A \cos B = 1/5$ (b) $\cos A \cos B = -1/5$

   (c) $\sin A \sin B = -2/5$ (d) $\sin A \sin B = -1/5$

9. The most general value of θ which satisfies both the equations $\sin\theta = \frac{-1}{2}$ and tan θ is

(a) $2n\pi + \pi/6$ (b) $2n\pi + 7\pi/6$

(c) $2n\pi + 11\pi/6$ (d) None of these

10. The value of θ satisfying $\cos\theta + \sqrt{3}\sin\theta = 2$ is

(a) $5\pi/3$ (b) $4\pi/3$

(c) $2\pi/3$ (d) $\pi/3$

11. The principal value of $\sin^{-1}\left(\sin\frac{5\pi}{3}\right)$ is

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

(c) $\frac{-5\pi}{3}$ (d) $\frac{5\pi}{3}$

12. The principal value of $\sin^{-1}\left[\sin\left(\frac{2\pi}{3}\right)\right]$ is

(a) $-2\pi/3$ (b) $2\pi/3$

(c) $4\pi/3$ (d) None of these

13. $\cos^{-1}\left(\frac{1}{2}\right) + 2\sin^{-1}\left(\frac{1}{2}\right)$ is equal to

(a) $\pi/6$ (b) $\pi/3$

(c) $2\pi/3$ (d) $\pi/4$

14. If P_1, P_2, P_3 are the perpendicular from the angular points of a triangle on the opposite sides then $\frac{1}{P_1} + \frac{1}{P_2} + \frac{1}{P_3} =$

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

(c) $3/r$ (d) None of these

15. If in a ΔABC, 2cosA = sinB cosec C then

(a) 2a = bc (b) c = a

(c) a = b (d) b = c

16. In a ΔABC, if $\cos B = \frac{\sin A}{2\sin C}$, then the triangle is

(a) equilateral (b) isosceles

(c) right angled (d) none of these

17. A man of height 6 ft, observes the top of a tower and the foot of the tower at angles of 45^0 and 30^0 of elevation and depression respectively. The height of the tower is

(a) $\left(1+\sqrt{3}\right)$m (b) $3\left(1+\sqrt{3}\right)$m

(c) $6\left(1+\sqrt{3}\right)$m (d) None of these

18. From the top of a diff 300 metres high, the top of a tower was observed at an angle of depression 30^0 and from the foot of the tower the top of the cliff was observed at an angle of elevation 45^0. The height of the tower is

(a) $50\left(3-\sqrt{3}\right)$m (b) $200\left(3-\sqrt{3}\right)$m

(c) $100\left(3-\sqrt{3}\right)$m (d) None of these

19. The length of the median through A of a triangle whose vertices are $A(-1,3), B(1-1)$ and $C(5,1)$ is

(a) 5 (b) 4

(c) 1 (d) None of these

20. The equation of the straight line, passing through the point (1, -2) and parallel to the line $8x - 4y + 7 = 0$ is

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

(c) $2x - y - 4 = 0$ (d) None of these

21. The distance between the lines $5x - 12y + 2 = 0$ and $5x - 12y - 3 = 0$ is

(a) $3/13$ (b) $5/13$

(c) $7/13$ (d) None of these

22. On the portion of the straight line $x + y = 2$ which is intercepted between the axes, a square is constructed away from the origin, with this portion as one of its side, If P denotes the perpendicular distance of a side of this square from the origin then the maximum value of P is

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

(c) $3\sqrt{2}$ (d) $4\sqrt{2}$

23. The pair of lines which join the origin to the points of intersection of the line $y = mx + c$ with the curve $x^2 + y^2 = a^2$ are at right angles if

(a) $c^2 = a^2\left(1+m^2\right)$ (b) $2c^2 = a^2\left(1+m^2\right)$

(c) $2c^2 = a^2\left(1-m^2\right)$ (d) None of these

24. If the lines represented by the equation $3y^2 - x^2 + 2\sqrt{3}x - 3 = 0$ are rotated about the point $\left(\sqrt{3},0\right)$ through an angle 15^0, one clockwise direction and other in anticlockwise direction then the equation of the pair of lines in the new position is

(a) $y^2 - x^2 + 2\sqrt{3}x + 3 = 0$

(b) $y^2 - x^2 + 2\sqrt{3}x - 3 = 0$

(c) $y^2 - x^2 - 2\sqrt{3}x + 3 = 0$

(d) None of these

25. The sides of a square are x = 2, x = 3, y = 1 and y = 2. The equation of the circle drawn on the diagonals of the square as its diameter is

(a) $x^2 + y^2 - 5x - 3y + 8 = 0$

(b) $x^2 + y^2 + 5x - 3y + 8 = 0$

(c) $x^2 + y^2 + 5x + 3y - 8 = 0$

(d) None of these

26. If the equation of a circle is $3x^2 + 3y^2 + kxy + 9x + (K-6)y + 3 = 0$ then its radius is

(a) $3/2$ (b) $\sqrt{17}/2$

(c) $2/3$ (d) None of these

27. If the circle $x^2 + y^2 + 6x + 8y + a = 0$ bisects the circumference of the circle $x^2 + y^2 + 2x - 6y - b = 0$, then a + b is equal to

(a) 38 (b) -38

(c) 42 (d) None of these

28. For the parabola $x^2 + 4x + 4y + 16 = 0$, the equation of the axis and the directrix are given by

(a) x + 2 = 0, y – 2 = 0 (b) x – 2 = 0, y + 2 = 0

(c) x + 2 = 0, y + 2 = 0 (d) None of these

29. The value of k for which the line x + y + 1 = 0 touches the parabola $y^2 = kx$ is

(a) -4 (b) 4

(c) 2 (d) -2

30. The portion of a tangent to a parabola $y^2 = 4ax$ cut off between the directrix and the curve subtends an angle θ at the focus where θ =

(a) $\pi/4$ (b) $\pi/3$

(c) $\pi/2$ (d) None of these

31. The equation of the ellipse referred to its axes as the axes of coordinates with minor axis 4 and the distance between the foci 2, is

(a) $\frac{x^2}{5} + \frac{y^2}{4} = 1$ (b) $\frac{x^2}{4} + \frac{y^2}{5} = 1$

(c) $\frac{x^2}{6} + \frac{y^2}{4} = 1$ (d) $\frac{x^2}{4} + \frac{y^2}{6} = 1$

32. The eccentricity of the curve represented by the equation $x^2 + 2y^2 - 2x + 3y + 2 = 0$ is

(a) 0 (b) $1/2$

(c) $1/\sqrt{2}$ (d) $\sqrt{2}$

33. If $\frac{x}{a} + \frac{y}{b} = \sqrt{2}$ touches the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, then its eccentric angle θ is equal to

(a) 0 (b) 90^0

(c) 45^0 (d) 60^0

34. If the tangent at the point $(2\sec\theta, 3\tan\theta)$ of the hyperbola $\frac{x^2}{4}-\frac{y^2}{9}=1$ is parallel to $3x-y+4=0$ then the value of θ is

(a) 45^0 (b) 60^0
(c) 30^0 (d) 75^0

35. The asymptotes of the hyperbola $xy-3x+4y+2=0$ are

(a) $x=-4, y=3$ (b) $x=4, y=3$
(c) $x=2, y=-3$ (d) $x=2, y=3$

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

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

37. The domain of the function $f(x)=\log_{1/2}\left(x-\frac{1}{2}\right)+\log_2\sqrt{4x^2-4x+5}$ is

(a) $\left[\frac{1}{2},\infty\right)$ (b) $\left(\frac{1}{2},\infty\right)$
(c) $(-\infty,\infty)$ (d) None of these

38. The range of the function $f(x)=\tan\sqrt{\frac{\pi^2}{9}-x^2}$ is

(a) $\left[0,\sqrt{3}\right]$ (b) $\left(0,\sqrt{3}\right)$
(c) $\left[0,\sqrt{3}\right]$ (d) $\left(0,\sqrt{3}\right]$

39. If $f(x)=64x^3+\frac{1}{x^3}$ and a, b are the roots of $4x+\frac{1}{x}=3$, then

(a) f(a) = 12 (b) f(b) = 11
(c) f(a) = f(b) (d) None of these

40. $\lim_{x\to 0}\frac{\sin\left(\pi\cos^2 x\right)}{x^2}$ equals

(a) $-\pi$ (b) π
(c) $\pi/2$ (d) 1

41. The value of $\lim_{x\to\infty}\frac{x^5}{5^x}$ is

(a) 1 (b) -1
(c) 0 (d) None of these

42. $\lim_{x\to\infty}\left(\sin\sqrt{x+1}-\sin\sqrt{x}\right)$ is equal to

(a) 1 (b) -1
(c) 0 (d) None of these

43. $\lim_{x\to\infty} x^x$ is equal to

(a) 0 (b) 1

(c) -1 (d) None of these

44. Let $f(x)=\begin{cases}\dfrac{1+\cos x}{(\pi-x)^2}.\dfrac{\sin^2 x}{\log(1+\pi^2-2\pi x+x^2)}, x\neq\pi\end{cases}$. If f(x) is continuous at x = π, then k is equal to

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

(c) $-1/2$ (d) $-1/4$

45. The point (s) of the discontinuity of the function $f(x)\begin{cases}\frac{1}{5}(2x^2+3), x\le 1\\ 6-5x, 1<x<3 \text{ is(are)}\\ x-3, x\ge 3\end{cases}$

(a) x = 1 (b) x = 3

(c) x = 1, 3 (d) None of these

46. If f(x + y) = 2f(x). f(y) for x, y, where $f^1(0) = 3$ and f(4) = 2, then $f^1(4)$ is equal to

(a) 6 (b) 12

(c) 4 (d) None of these

47. If $y = a\cos(\log x)+b\sin(\log x)$, then $x^2\dfrac{d^2y}{dx^2}+x\dfrac{dy}{dx}=$

(a) 0 (b) y

(c) -y (d) None of these

48. If $x^2+y^2=t+\dfrac{1}{t}$ and $x^4+y^4=t^2+\dfrac{1}{t^2}$ then $\dfrac{dy}{dx}$ is equal to

(a) $\dfrac{y}{x}$ (b) $\dfrac{-y}{x}$

(c) $\dfrac{x}{y}$ (d) $\dfrac{-x}{y}$

49. If $y = x^{(\log x)\log\log x}$, then $\dfrac{dy}{dx}$ is equal to

(a) $\dfrac{y\log y}{x\log x}(2\log\log x+1)$

(b) $\dfrac{x\log x}{y\log y}(2\log\log x+1)$

(c) $\dfrac{2y\log y}{x\log x}(\log\log x+1)$

(d) None of these

50. The angle between the tangents to the curve $y^2 = 2ax$ at the points where $x = a/2$ is

(a) $\pi/6$ (b) $\pi/4$

(c) $\pi/3$ (d) $\pi/2$

51. The curve $y^2 = 2x$ and $2xy = k$ cut at right angles if

(a) $k^2 = 8$ (b) $k^2 = 4$

(c) $k^2 = 2$ (d) None of these

52. The maximum value of the function $y = x(x-1)^2, o \le x \le 2$ is

(a) 0 (b) $4/27$

(c) -4 (d) None of these

53. The function $-4\text{Noneof}(x) = \sin^4 x + \cos^4 x$ increase in the interval

(a) $\left(0, \frac{\pi}{8}\right)$ (b) $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

(c) $\left(\frac{3\pi}{8}, \frac{5\pi}{8}\right)$ (d) $\left(\frac{5\pi}{8}, \frac{3\pi}{4}\right)$

54. The derivative of $\tan^{-1}\frac{\sqrt{1+x^2}-1}{x}$ w.r.t. $\cos^{-1}\sqrt{\frac{1+\sqrt{1+x^2}}{2\sqrt{1+x^2}}}$ is

(a) 1 (b) -1

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

55. If $y = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$, then $\frac{dy}{dx}$ is equal.

(a) $\frac{2}{1+x^2}$, when $-1 < x < 1$

(b) $\frac{2}{1+x^2}$, when $x < -1$ or $x > 1$

(c) $\frac{-2}{1+x^2}$, when $-1 < x < 1$

(d) None of these

56. $\int \frac{\cot x}{\sqrt{\sin x}} dx$ is equal to

(a) $2\sqrt{\sin x} + c$ (b) $\frac{1}{2\sqrt{\sin x}} + c$

(c) $\frac{-2}{\sqrt{\sin x}} + c$ (d) $\frac{2}{\sqrt{\sin x}} + c$

57. $\int \frac{\sqrt[3]{1+\sqrt[4]{x}}}{\sqrt{x}} dx$ is equal to

(a) $12\left(\frac{\left(1+\sqrt[4]{x}\right)^{7/3}}{7} + \frac{\left(1+\sqrt[4]{x}\right)^{4/3}}{4}\right) + c$

(b) $12\left(\frac{\left(1+\sqrt[4]{x}\right)^{7/3}}{7}-\frac{\left(1+\sqrt[4]{x}\right)^{4/3}}{4}\right)+c$

(c) $6\left(\frac{\left(1+\sqrt[4]{x}\right)^{7/3}}{7}-\frac{\left(1+\sqrt[4]{x}\right)^{4/3}}{4}\right)+c$

(d) None of these

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

(a) $e^x\left(\frac{1-x}{1+x^2}\right)+c$ (b) $e^x\left(\frac{x-1}{1+x^2}\right)+c$

(c) $\frac{e^x}{1+x^2}+c$ (d) None of these

59. Integral of $\frac{1}{1+(\log x)^2}$ with respect to log x is

(a) $\frac{\tan^{-1}(\log x)}{x}+c$ (b) $\tan^{-1}(\log x)+c$

(c) $\frac{\tan^{-1}x}{x}+c$ (d) None of these

60. $\int_0^{\pi/4}\frac{\sin^2 x.\cos^2 x}{\left(\sin^3 x+\cos^3 x\right)^2}dx$ is equal to

(a) $1/6$ (b) $1/12$

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

61. The value of the integral $\int_0^{2[x]}(x-[x])dx$ is

(a) $[x]$ (b) $\frac{1}{2}[x]$

(c) $3[x]$ (d) $2[x]$

62. The value of the integral $\int_{-3}^{3}\frac{x-4}{|x-4|}dx$ is

(a) 0 (b) 6

(c) -6 (d) None of these

63. The value of $\int_0^{\pi/2}|\sin x-\cos x|dx$ is

(a) 0 (b) $2\left(\sqrt{2}-1\right)$

(c) $2\sqrt{2}$ (d) $2\left(\sqrt{2}+1\right)$

64. The solution of the equation $y\sin x\frac{dy}{dx}=\cos x\left(\sin x-\frac{y^2}{2}\right)$ given y = 1 when x = $\pi/2$ is

(a) $y^2=\sin x$ (b) $y^2=2\sin x$

(c) $x^2=\sin y$ (d) $x^2=2\sin y$

65. The order and degree of the differential equation $\left(1+3.\frac{dy}{dx}\right)^{1/3}=\frac{7d^3y}{dx^3}$ are

(a) $1,\frac{2}{3}$ (b) $(3,4)$

(c) $(3,3)$ (d) $(1,2)$

66. The solution of the differential equation $2x\frac{dy}{dx}-y=3$ represent

(a) circle (b) straight line

(c) ellipse (d) parabola

67. The modulus of $\frac{(3+2i)^2}{(4-3i)}$ is

(a) $13/5$ (b) $11/5$

(c) $9/5$ (d) $7/5$

68. The continued product of the four values of $\left[\cos\left(\frac{\pi}{3}\right)+i\sin\left(\frac{\pi}{3}\right)\right]^{3/4}$ is

(a) -1 (b) 1

(c) 2 (d) -2

69. If ω, ω^2 be the imaginary cube roots of units, then $\left(3+3\omega+5\omega^2\right)^6-\left(2+6\omega+2\omega^2\right)^3$ is equal to

(a) 1 (b) 2

(c) 0 (d) -1

70. Let z be a complex number with modulus 2 and argument $\frac{2\pi}{3}$, then z is equal to

(a) $-1+i\sqrt{3}$ (b) $1-i\sqrt{3}$

(c) $\frac{-1}{3}+\frac{i\sqrt{3}}{2}$ `(d) None of these

71. In an A.P. of 81 terms, the 41th term is 10. Then the sum of series is

(a) 10 × 41 (b) $\frac{10\times41}{2}$

(c) 10 × 81 (d) 41 × 81

72. If the n^{th} term of a series is $\frac{3+n}{4}$, then the sum of 105 terms is

(a) 1470 (b) 1360

(c) 1530 (d) None of these

73. If a, b, c, d, e, f are in A.P., then e – c is equal to

(a) $2(c-a)$ (b) $2(d-c)$

(c) $2(f-d)$ (d) $d-c$

74. If the sum of three numbers in A.P. is 12 and the sum of their cubes is 288, then the numbers are

(a) 2, 4, 6 (b) 1, 4, 7

(c) 1, 3, 5 (d) None of these

75. The values of k for which the quadratic equation $kx^2+1=kx+3x-11x^2$ has real and equal roots are

(a) $\{-11,-3\}$ (b) $\{5,7\}$

(c) $\{5,-7\}$ (d) None of these

ANSWER KEYS

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