# TEST PAPER 3

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

1. If $\cos ec\theta = x + \frac{1}{4x}$ then the value of $\cos ec\theta + \cot\theta$ is

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

2. If $\sin(A+B+C) = 1, \tan(A-B) = \frac{1}{\sqrt{3}}$ and $\sec(A+C) = 2$, then

   (a) $A = 90^0, B = 60^0, C = 30^0$
   (b) $A = 120^0, B = 60^0, C = 0^0$
   (c) $A = 60^0, B = 30^0, C = 0^0$
   (d) None of these

3. The value of $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$ is

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

4. The solution of the equation $\cos^2\theta + \sin\theta + 1 = 0$, lies in the interval.

   (a) $\left(\frac{-\pi}{4}, \frac{\pi}{4}\right)$ (b) $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$
   (c) $\left(\frac{3\pi}{4}, \frac{5\pi}{4}\right)$ (d) $\left(\frac{5\pi}{4}, \frac{7\pi}{4}\right)$

5. Solution of the equation $4\cos 2\theta = \cot^2\theta - \tan^2\theta$ is

   (a) $\theta = n\pi \pm \frac{\pi}{2}$ (b) $\theta = n\pi \pm \frac{\pi}{3}$
   (c) $\theta = n\pi \pm \frac{\pi}{4}$ (d) None of these

6. The value of $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{3}$ is

   (a) $\pi/4$ (b) $\pi/6$
   (c) $\pi/3$ (d) 0

7. $\sin^{-1}\left(\cos\left(\sin^{-1}x\right) + \cos^{-1}\right)\left(\sin\left(\cos^{-1}x\right)\right)$ is is equal to

   (a) $\pi/4$ (b) $\pi/2$
   (c) $3\pi/4$ (d) 0

8. If $\left(\sin^{-1}x\right)^2 + \left(\cos^{-1}x\right)^2 = \frac{5\pi^2}{8}$, then x is equal to

(a) 1, 2 (b) -1, 2

(c) $1/\sqrt{2}, \frac{-1}{\sqrt{2}}$ (d) $-1/\sqrt{2}, 0$

9. The angle C of the triangle ABC in which $(c+a+b)(a+b-c) = ba$ is

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

(c) $\pi/6$ (d) $\pi/4$

10. In any $\Delta ABC$, abc S $\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$ =

(a) $\Delta^3$ (b) $3\Delta^2$

(c) $\Delta^2$ (d) None of these

11. A person, standing on the bank of a river observes that the angle subtended by a tree on the opposite bank is $60^0$,when he retreats 40m from the bank, he finds the angle to be $30^0$. The height of the tree and the breadth of the river are

(a) $10\sqrt{3}$m,10m (b) $20\sqrt{3}$m,10m

(c) $20\sqrt{3}$m, 20m (d) None of these

12. At the foot of the mountain the elevation of its summit is $45^0$, after ascending 1000m towards the mountain up a slope of $30^0$ inclination, the elevation is found to be $60^0$. The height of the mountain is

(a) $\frac{\sqrt{3}+1}{2}$m (b) $\frac{\sqrt{3}-1}{2}$m

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

13. If $\alpha, \beta, \gamma$ are the real roots of the equation $x^3 - 3Px^2 + 3qx - 1 = 0$, then the centroid of the triangle having vertices $\left(\alpha, \frac{1}{\alpha}\right), \left(\beta, \frac{1}{\beta}\right)$ and $\left(\gamma, \frac{1}{\gamma}\right)$ are

(a) (P, q) (b) (P, -q)

(c) (-P, q) (d) (-P, -q)

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

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

(c) $2x + y + 6 = 0$ (d) $2x - y + 6 = 0$

15. If the lines x – 2y – 6 = 0, 3x + y – 4 = 0 and $\lambda x + 4y + \lambda^2 = 0$ are concurrent, then

(a) $\lambda = 2$ (b) $\lambda = -3$

(c) $\lambda = 4$ (d) None of these

16. If the ratio of gradients of the lines, represented by $ax^2 + 2hxy + by^2 = 0$ is 1 : 3, then the value of the ratio $h^2$ : ab is

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

(c) $4/3$ (d) 1

17. If the angle between the two lines represented by $2x^2+5xy+3y^2+6x+7y+4=0$ is $\tan^{-1} m$, then m =

(a) $1/5$ (b) 1

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

18. The equation of that diamenter of the circle $x^2+y^2-6x+2y-8=0$, which passes through the origin, is

(a) x – 3y = 0 (b) x + 3y = 0

(c) 3x – y = 0 (d) None of these

19. If the line 2x – y + k = 0 is a diameter of the circle $x^2+y^2+6x-6y+5=0$ then k is equal to

(a) 12 (b) 9

(c) 6 (d) 3

20. The locus of a point whose sum of the distances from the origin and the line x = 2 is 4 units is

(a) $y^2=-12(x-3)$ (b) $y^2=12(x-3)$

(c) $x^2=12(y-3)$ (d) $x^2=-12(y-3)$

21. In an ellipse the distance between its foci is 6 and length of its minor axis is 8. Then its eccentricity is

(a) $3/5$ (b) $1/\sqrt{52}$

(c) $1/2$ (d) $4/5$

22. The eccentricity of the hyperbola $\frac{\sqrt{1999}}{3}(x^2-y^2)=1$ is

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

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

23. Equation of the tangent to the hyperbola $2x^2-3y^2=6$ which is parallel to the line y = 3x + 4 is

(a) y = 3x + 5

(b) y = 3x – 5

(c) y = 3x + 5 and y = 3x – 5

(d) None of these

24. The mirror image of the directrix of the parabola $y^2=4(x+1)$ in the line mirror x + 2y = 3 is

(a) x = -2 (b) 4y – 3x = 16

(c) 3x – 4y + 16 = 0 (d) None of these

25. If the distance of a point on the ellipse $x^2/6+y^2/2=1$ from the centre is 2, then the eccentric angle is

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

(c) $\pi/6$ (d) $\pi/2$

26. The domain of the function $f(x)=\sqrt{x-1}+\sqrt{5-x}$ is

(a) $[1,\infty)$ (b) $(-\infty,5)$

(c) $(1,5)$ (d) $[1,5]$

27. The period of the function $f(x)=\sin^4 2x+\cos^4 2x$ is

(a) $\pi/2$ (b) $\pi/8$

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

28. If $f(x)=\log\left(\frac{1-x}{1+x}\right)$, then $f\left(\frac{2x}{1+x^2}\right)=$

(a) f(x) (b) 2f(x)

(c) 3f(x) (d) 4f(x)

29. The value of $\lim_{x\to 0}\frac{e^x-(1+x)}{x^2}$ is

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

(c) 0 (d) $1/4$

30. The value of $\lim_{x\to\infty}\left(\frac{2x^2+3}{2x^2+5}\right)^{8x^2+3}$ is

(a) $e^8$ (b) $e^{-8}$

(c) $e^4$ (d) $e^{-4}$

31. $\lim_{x\to 2}\frac{2-\sqrt{2+x}}{\sqrt[3]{2}-\sqrt[3]{4-X}}$ is equal to

(a) $\frac{2}{2^{4/3}}$ (b) $\frac{-3}{2^{4/3}}$

(c) $\frac{3}{2^{3/4}}$ (d) $\frac{-3}{2^{3/4}}$

32. If $f(x)=\begin{cases}\frac{1-\sin^2 x}{3\cos^2 x}, x<\frac{\pi}{2}\\ \frac{b(1-\sin x)^{x-\pi/2}}{(\pi-2x)^2}, x>\frac{\pi}{2}\end{cases}$ Then f(x) is continuous at $x=\pi/2$ is

(a) $a=1/3, b=2$ (b) $a=1/3, b=8/3$

(c) $a=2/3, b=8/3$ (d) None of these

33. The function $f(x)=\frac{1}{u^2+u-2}$, where $u=\frac{1}{x-1}$ is discontinuous at the points

(a) x = -2, 1, 1/2 (b) x = ½, 1, 2

(c) x = 1, 0 (d) None of these

34. If $f(x)=(-1)^{[x^3]}$, where [.] denotes the greatest integer Function, then

(a) f(x) is continuous for $x = n^{1/3}$, where $n \in 1$

(b) $f\left(3/2\right) = 1$

(c) $f^1(x) = 0$ for $-1 < x < 1$

(d) None of these

35. If $f(x) = |\cos x|$, then $f^1\left(\frac{3\pi}{4}\right)$ is equal to

(a) $-1/\sqrt{2}$ (b) $1/\sqrt{2}$

(c) 1 (d) None of these

36. If y = sinx, then $\frac{d^2}{dy^2}\left(\cos^7 x\right)$ is equal to

(a) $35\cos^3 x - 42\cos^5 x$ (b) $35\cos^3 x + 42\cos^5 x$

(c) $42\cos^3 x - 35\cos^5 x$ (d) None of these

37. If f(x) = |x – 3| and $\phi$ (x) = (fof)(x), then for x > 10, $\phi^1(x)$ is equal to

(a) 1 (b) 0

(c) -1 (d) None of these

38. The equation of the normal to the curve $y = e^{-2|x|}$ at the point where the curve cuts the line $x = \frac{1}{2}$ is

(a) $2e\left(ex + 2y\right) = e^2 - 4$

(b) $2e\left(ex - 2y\right) = e^2 - 4$

(c) $2e\left(ex - 2x\right) = e^2 - 4$

(d) None of these

39. The maximum value of $\frac{\log x}{x}$ is

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

(c) 1 (d) d = e

40. If y = f(x) be the equation of an ellipse to which the line y = 2x + 3 is a tangent at the point where x = 2, then

(a) $f^1(2) = 2$ (b) $f\left(2\right) = 2f^1(2)$

(c) $f\left(2\right) + f^1\left(2\right) + f^{11}\left(2\right) = 2$

(d) None of these

41. The value of $\int \frac{\left(x - x^3\right)^{1/3}}{x^4} dx$ is

(a) $\frac{1}{8}\left(x-\frac{1}{x^2}\right)^{4/3}+1+c$

(b) $\frac{3}{8}\left(\frac{1}{x^2}-1\right)+c$

(c) $-\frac{3}{8}\left(\frac{1}{x^2}-1\right)^{4/3}+c$

(d) None of these

42. The value of $\int\frac{\sqrt{1-x}}{x}dx$ is

(a) $2\sqrt{1+x}+1n\left|\frac{\sqrt{1+x}-1}{\sqrt{1+x}+1}\right|+c$

(b) $In\left(\frac{\sqrt{1+x}-1}{\sqrt{1+x}+1}\right)+c$

(c) $2\sqrt{1+x}+c$

(d) $\frac{\sqrt{1+x}-1}{\sqrt{1+x}+1}+c$

43. The antiderivative of the function (3x + 4) |sinx|, where $0 < x < \pi$, is given by

(a) $3\sin x-(3x+4)\cos x$

(b) $3\sin x+(3x+4)\cos x$

(c) $-3\sin x+(3x+4)\cos x$

(d) None of these

44. $\int_0^{\pi} x\sin^6 x\cos^4 x\ dx$ is equal to

(a) $\frac{3\pi^2}{512}$ (b) $\frac{3\pi^2}{256}$

(c) $\frac{3\pi^2}{1024}$ (d) None of these

45. The value of $\alpha$ which satisfies $\int_0^{\alpha}\cos x dx=\cos 2\alpha,^{\alpha\in[0.2\pi]}$ is

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

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

46. $\int_0^1 \frac{dx}{\left[ax+(1-x)b\right]^2}$ is equal to

(a) ab (b) a/b
(c) b/a (d) 1/ab

47. The degree of the differential equation of which $y^2 = 4a(x + a)$ is a solution, is
(a) 1 (b) 2
(c) 3 (d) None of these

48. Integrating Factor of differential equation $\cos x.\frac{dy}{dx}+y\sin x=1$ is

(a) sin x (b) sec x
(c) tan x (d) cos x

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

(a) circles (b) straight lines
(c) ellipse (d) parabola

50. If $\frac{(a+ib)^2}{a-ib}-\frac{(a-ib)^2}{a+ib}=x+iy$, then x

(a) $\frac{-2b^3}{\left(a^2+b^2\right)^2}$ (b) $\frac{6a^2b}{\left(a^2+b^2\right)^2}$
(c) 0 (d) None of these

51. If set A = {5, 15, 20, 30} and B = {3, 5, 15, 18, 20} then A∪B is
(a) {3, 5, 15, 18, 20, 30}
(b) {3, 18, 30}
(c) {2, 5, 15, 18, 20}
(d) {5, 15, 20}

52. In a group of people 65% speak German and 45 speak French. If 5% of the people speak neither French nor German, then the percentage of people who can speak both German and French is
(a) 5% (b) 10%
(c) 15% (d) 20%

53. Convert 103 of base to a number of base 3 is
(a) 12011 (b) 10211
(c) 10221 (d) 10031

54. If $(2311)_4 - (1111)_2 = (\times)_5$, then ×
(a) 1131 (b) 1130
(c) 1129 (d) None of these

55. Given A = {1, 2, 3}, B = {3, 4}, C = {4, 5, 6}, then (A × B) ∩ (B × C) is
(a) A null set of ordered pairs
(b) {(4, 3)}
(c) {(3, 4)}
(d) {(4, 3),(3,4)}

56. Value of $(x+1+i)(x+1-i)(x-1+i)(x-1-i)$ is

(a) $x^4+4$ (b) $x^3+3$

(c) $x^2+2$ (d) None of these

57. The multiplicative inverse of the complex number $z=3-2i$ is

(a) $\frac{3}{12}-\frac{2}{13}i$ (b) $\frac{3}{13}+\frac{2}{13}i$

(c) $-\frac{3}{13}+\frac{2}{13}i$ (d) $-\frac{3}{13}-\frac{2}{13}i$

58. If $(x+iy)(2-3i)=4+i$, find $(x+y)\div(y-x)$

(a) $\frac{14}{9}$ (b) $\frac{13}{9}$

(c) $\frac{-13}{9}$ (d) None of these

59. The conjugate of $\frac{(2+3i)^2}{2-i}$ is

(a) $\frac{22}{5}-\frac{9i}{5}$ (b) $\frac{22}{5}-\frac{9i}{5}$

(c) $-\frac{22}{5}-\frac{9}{5}i$ (d) $\frac{22}{5}+\frac{9}{5}i$

60. If ω is the cube root of unity then $(1+\omega-\omega^2)^7$ equals

(a) $128\,\omega$ (b) $-128\,\omega$

(c) $128\,\omega^2$ (d) $-128\,\omega^2$

61. The smallest positive integer for which $(1+i)^{2n}=(1-i)^{2n}$ is

(a) 4 (b) 8

(c) 2 (d) 12

62. If $\alpha+\beta=3, \alpha^3+\beta^3=7$, then α and β are the roots of

(a) $3x^3+9x+7=0$ (b) $9x^2-27x+20=0$

(c) $2x^2-6x+15=0$ (d) None of these

63. If one root of the equation $ix^2-2(i+1)x+(2-i)=0$ is $2-i$, then $\sqrt{\frac{P}{q}}+\sqrt{\frac{q}{P}}$ the other root is:

(a) $-i$ (b) $2+i$

(c) $i$ (d) $2-i$

64. If the ratio of the roots of the equation $lx^2+nx+n=0$ be $P:q$, then is equal to:

(a) 0 (b) $\sqrt{\frac{n}{l}}$

(c) $-\sqrt{\frac{n}{l}}$ (d) $-\sqrt{\frac{l}{n}}$

65. The value of $m$ for which the equation $x^3 - mx^2 + 3x - 2 = 0$ has two roots equal in magnitude but opposite in sign is

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

(c) $\frac{3}{4}$ (d) $\frac{4}{5}$

66. $T_n$ of an A.P. is 5 – 6n. The value of $S_n$ of the same A.P. is:

(a) $\left(2n - 3n^2\right)$ (b) $\left(3n - 2n^2\right)$

(c) $\left(2n + 3n^2\right)$ (d) None of these

67. If in an A.P. the sum of 10 items, is 11 and the sum to 11 terms is 19 then the sum of 30 terms is:

(a) -20 (b) 20

(c) 30 (d) -30

68. If $9^{th}$ terms of an A.P. is zero, and $29^{th}$ term is $n$ times, the $19^{th}$ term, then value of $n$ is:

(a) 2 (b) 3

(c) 4 (d) 5

69. An A.P. consists of 60 items. If the first and the last term be 7 and 125 respectively its $32^{nd}$ term is:

(a) 64 (b) 65

(c) 66 (d) 69

70. Let $S_n$ = denote the sum of first $n$ terms of an A.P.. If $S_{2n} = 3S_n$ then the ratio $S_{3n} / S_n$ is equal to

(a) 4 (b) 6

(c) 8 (d) 10

71. The sum of the first four terms of an A.P. is 56. The sum of the last four terms is 112. If its first term is 11, the number of terms is:

(a) 10 (b) 11

(c) 12 (d) None of these

72. The sum of 20 arithmetic means between 7 and 43 is:

(a) 360 (b) 400

(c) 500 (d) 440

73. Number of different signals can be given using any number of flags from 5 flags of different colour is?

(a) 325 (b) 240

(c) 120 (d) None of these

74. In how many ways a committee of 5 members can be selected from 6 men and 5 women, consisting of 3 men and 2 women?

(a) 320 (b) 200

(c) 450 (d) None of these

75. If $nC_{12} = nC_8$, then $n$ has the value

(a) 20 (b) 12

(c) 6 (d) 30

# ANSWER KEYS

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