1. The minimum value of 'n' for $\left(\frac{1+i}{1-i}\right)^n = 1$, where $i = \sqrt{-1}$ is :
(a) 2 (b) 4
(c) 6 (d) 3

2. Find the value of $\sqrt{6+\sqrt{6+\sqrt{6\ldots\infty}}}$:
(a) 2 (b) 3
(c) -4 (d) 6

3. If $\arg\left(\frac{z-1}{z+1}\right) = \frac{\pi}{3}$, then given locus represent a :
(a) straight line (b) circle
(c) parabola (d) ellipse

4. If $z_k = \cos\frac{\theta}{2^k} + i\sin\frac{\theta}{2^k}$ where $k = 1, 2, 3, \ldots,$ and $\theta = 2n\pi, n \in I$, then $z_1, z_2, z_3, \ldots \infty$ is equal to :
(a) 0 (b) 1
(c) -1 (d) i

5. $(\sin\theta + i\cos\theta)^4$ is equal to :
(a) $\sin 4\theta + i\cos 4\theta$ (b) $\sin 4\theta - i\sin 2\theta$
(c) 0 (d) none of these

6. The angle of elevation of the top of an incomplete vertical pillar at a horizontal distance of 100 m from its base is 45°. If the angle of elevation of the top of the complete pillar at the same point is to be 60°, then the height of the incomplete pillar is to be increased by :
(a) $50\sqrt{3}$ m (b) 100 m
(c) $100(\sqrt{3}-1)$ m (d) $100(\sqrt{3}+1)$ m

7. If $x^2 + y^2 = 25$, $xy = 12$, then x is equal to :
(a) 3, 4 (b) 3, -3
(c) 3, 4, -3, -4 (d) -3, -3

8. If $b+c, c+a, a+b$ are in HP, then a^2, b^2, c^2 are in :
(a) AP (b) HP
(c) GP (d) none of these

9. Series $\frac{1}{1!(n-1)!} + \frac{1}{3!(n-3)!} + \frac{1}{5!(n-5)!} + \ldots$ is equal to :
(a) $\frac{2^n}{n!}$ (b) $\frac{2^{n-1}}{n!}$
(c) 0 (d) none of these

10. The number of terms in the expansion of $(a+b+c)^n$ will be :
(a) $n+1$ (b) $n+3$
(c) $\frac{(n+1)(n+2)}{2}$ (d) none of these

11. If the equation $mx^2 - 4x + 2(m+1) = 0$ has real roots, then the value of m lies in the interval :
(a) $-2 \le m \le 1$ (b) $-1 \le m \le 1$
(c) $2 < m < 3$ (d) none of these

12. If $x^2 + ax + \beta = 0$ and $x^2 + px + q = 0$ has a common root, then the common root is :
(a) $\frac{q+\beta}{a+p}$ (b) $\frac{q-\beta}{a+p}$
(c) $\frac{q-\beta}{a-p}$ (d) none of these

13. Equation of the pair of tangents drawn from the origin to the circle $x^2+y^2+2gx+2fy+c=0$ is :

(a) $g x + f y = c (x^2 + y^2)$

(b) $(g x + f y)^2 = x^2 + y^2$

(c) $(g x + f y)^2 = c^2 (x^2 + y^2)$

(d) $(g x + f y)^2 = c (x^2 + y^2)$

14. The length of transverse axis of the hyperbola $3x^2 - 4y^2 = 32$ is :

(a) $\frac{8\sqrt{2}}{\sqrt{3}}$ (b) $\frac{16\sqrt{2}}{\sqrt{3}}$

(c) $\frac{3}{32}$ (d) $\frac{64}{3}$

15. The value of coefficient which is independent from x in $\left(2x - \frac{3}{x^2}\right)^6$, is :

(a) – 2916 (b) 4860

(c) 2160 (d) none of these

16. The coefficient of x^4 in the expansion of $(1 + x + x^2 + x^3)^n$, is :

(a) ${}^nC_4$

(b) ${}^nC_4 + {}^nC_2$

(c) ${}^nC_4 + {}^nC_4 + {}^nC_2$

(d) ${}^nC_4 + {}^nC_2 {}^nC_1 + {}^nC_2$

17. In ΔABC, $\frac{\cos 2A}{a^2} - \frac{\cos 2B}{b^2}$ is equal to :

(a) c^2/a^2b^2 (b) $\frac{1}{a^2} - \frac{1}{b^2}$

(c) $\frac{1}{ab}$ (d) none of these

18. If $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$, then the value of A^n where $n = 1, 2, 3, \ldots$:

(a) $\begin{bmatrix} \cos^n x & \sin^n x \\ -\sin^n x & \cos^n x \end{bmatrix}$

(b) $\begin{bmatrix} \cos^2 nx & \sin^2 nx \\ -\sin^2 nx & \cos^2 nx \end{bmatrix}$

(c) $\begin{bmatrix} \cos nx & \sin nx \\ -\sin nx & \cos nx \end{bmatrix}$

(d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

19. If $A^2 - A + I = 0$, then the inverse of A is :

(a) A^{-1} (b) $A + I$

(c) $I - A$ (d) $A - I$

20. Let $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$, then A^n is equal to :

(a) $\begin{bmatrix} 1 & 2n \\ 0 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & n \\ 0 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 2n \\ 0 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & n \\ 0 & 2 \end{bmatrix}$

21. In triangle ABC, $\angle A = 90°$ and $AB = AC$ and the coordinate of B and C are $(-3, 6)$ and $(1, 2)$ respectively, then the area of triangle is :

(a) 4 sq unit (b) $4\sqrt{2}$ sq unit

(c) 8 sq unit (d) 16 sq unit

22. If $x + 2y + 1 = 0$, then reflection point of $(3, 2)$ is :

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

(c) $(4, 1)$ (d) $\left(-\frac{1}{5}, -\frac{22}{5}\right)$

23. Re $\left(\frac{(1+i)^2}{3-i}\right)$ is equal to :

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

(c) $1/10$ (d) $-1/10$

24. Which term of the series $3 + 8 + 13 + 18 + \ldots$ is 498 :

(a) 95th (b) 100th

(c) 102th (d) 101th

25. If one root of $5x^2 + 13x + k = 0$ is reciprocal of the other, then k is equal to :

(a) 0 (b) 5

(c) 1/6 (d) 6

26. The point having position vectors $2\hat{i} + 3\hat{j} + 4\hat{k}$, $3\hat{i} + 4\hat{j} + 2\hat{k}$, $4\hat{i} + 2\hat{j} + 3\hat{k}$ are the vertices of :

(a) right angled triangle

(b) isosceles triangle

(c) equilateral triangle

(d) collinear

27. If a polygon has 44 diagonals, then the number of its side are :

(a) 7 (b) 11

(c) 8 (d) none of these

28. $\sin^{-1}\frac{3}{5} + \tan^{-1}\frac{1}{7}$ is equal to :

(a) $\pi/2$ (b) $\cos^{-1} 4/5$

(c) π (d) $\pi/4$

29. Let p be the proposition that mathematics is interesting and let q be the proposition that mathematics is difficult, then the symbol $p \wedge q$ means :

(a) mathematics is interesting implies that mathematics is difficult
(b) mathematics is interesting implies and is implied by mathematics is difficult
(c) mathematics is interesting and mathematics is difficult
(d) mathematics is interesting or mathematics is difficult

30. The statement $p \vee \sim p$ is :
(a) tautology
(b) contradiction
(c) neither a tautology nor a contradiction
(d) none of the above

31. Which of the following function is periodic with period π ?
(a) $f(x) = x \cos x$ (b) $f(x) = |\cos x|$
(c) $f(x) = \sin x$ (d) $f(x) = [x + \pi]$
Where $[x]$ means the greater integer not greater than x.

32. $\frac{e^2 + 1}{2e}$ is equal to :
(a) $1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \ldots \infty$
(b) 0
(c) 1
(d) none of the above

33. $\lim_{x \to 0} \frac{x \sin^{-1} x}{\sin x^2}$ is equal to :
(a) 0 (b) 1
(c) 2 (d) ∞

34. If $y = \sin^{-1}(\cos x)$, then $\frac{dy}{dx}$ is equal to :
(a) $\frac{1}{\sin x}$ (b) $\cos^{-1} x$
(c) -1 (d) $\frac{1}{2}$

35. If $e^x \sin y - e^y \cos x = 1$, then $\frac{dy}{dx}$ is equal to :
(a) $\frac{e^x \sin y + e^y \sin x}{e^y \cos x - e^x \cos y}$
(b) $\frac{e^x \sin x + e^y \sin y}{e^y \cos x - e^x \cos y}$
(c) $\frac{e^x \sin y - e^y \sin x}{e^y \cos x - e^x \cos y}$
(d) none of the above

36. If $y = \cos t$ and $x = \sin t$, then $\frac{d^2y}{dx^2}$ is equal to :
(a) $\frac{y}{x}$ (b) $\frac{x}{y}$
(c) 0 (d) none of these

37. The tangent to the curve $y = e^{2x}$ at the point $(0, 1)$ meet the x-axis at :
(a) $(0, 4)$ (b) $(2, 0)$
(c) $(-1/2, 0)$ (d) none of these

38. $\log_e x$ is equal to :
(a) $(x-1) - \frac{(x-1)^2}{2} + \frac{(x-1)^3}{3} - \ldots \infty$
(b) 0
(c) 1
(d) none of the above

39. $\int \frac{xe^x}{(x+1)^2} dx$ is equal to :
(a) $\frac{e^x}{x+1} + c$ (b) $\frac{e^x}{(x+1)^2} + c$
(c) $\frac{e^x}{(x+1)^3} + c$ (d) none of these

40. $\int \frac{\tan x}{\sec x + \tan x} dx$ is equal to :
(a) $x + \sec x + \tan x + c$
(b) $x - \sec x + \tan x + c$
(c) $x - \tan x + \sec x + c$
(d) none of the above

41. $\lim_{x \to a} \frac{\sqrt{3x - a} - \sqrt{x + a}}{x - a}$ is equal to :
(a) $\sqrt{2a}$ (b) $\frac{1}{\sqrt{2a}}$
(c) $2a$ (d) $\frac{1}{2a}$

42. $\int_0^1 \frac{x}{(1-x)^{3/4}} dx$ is equal to :
(a) $\frac{-12}{5}$ (b) $\frac{16}{5}$
(c) $\frac{-16}{5}$ (d) none of these

43. $\int \frac{x^5}{\sqrt{1 + x^3}} dx$ is equal to :
(a) $\frac{2}{9}(1 + x^3)^{3/2} + c$
(b) $\frac{2}{9}(1 + x^3)^{3/2} + \frac{2}{3}(11 - x^3)^{1/2} + c$

(b) $\frac{2}{9}(1+x^3)^{3/2}+\frac{2}{3}(11-x^3)^{1/2}+c$

(c) $\frac{2}{9}(1+x^3)^{3/2}-\frac{2}{3}(1+x^3)^{1/2}+c$

(d) none of the above

44. $\int_1^2 \log x\,dx$ is equal to :

(a) $\log\left(\frac{e}{2}\right)$ (b) $\log\left(\frac{2}{e}\right)$

(c) $\log\left(\frac{e}{4}\right)$ (d) $\log\left(\frac{4}{e}\right)$

45. The value of a for which the function $f(x)=a\sin x+\frac{1}{3}\sin 3x$ has an extremum at $x=\frac{\pi}{3}$, is :

(a) 1 (b) -1

(c) 0 (d) 2

46. If θ is the angle between the vectors $\vec{a}=2\hat{i}-\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}+2\hat{j}+\hat{k}$, then the angle is :

(a) 1 (b) $\cos^{-1}\frac{1}{6}$

(c) $\frac{1}{\sqrt{6}}$ (d) none of these

47. Two dice are thrown simultaneously. The probability that the sum of the points on two dice will be 7, is :

(a) 5/36 (b) 1/6

(c) 7/36 (d) 2/9

48. Two parallel forces not having the same line of action form a couple, if they are :

(a) like and unlike

(b) like and equal

(c) unequal and unlike

(d) equal and unlike

49. A particle is projected from the top of a tower h metres high and at the same moment particle is projected upwards from the bottom of the tower. If the two particles meet when the upper one has described $(1/n)$th of the distance, then the velocity of the projection of the lower particle is :

(a) $\sqrt{ngh}$ (b) $\frac{1}{2}\sqrt{ngh}$

(c) $\sqrt{2ngh}$ (d) $\sqrt{\frac{1}{2}ngh}$

50. A particle is projected with a velocity v_0 so that its range on a horizontal plane is twice the greatest height attained. The range is :

(a) $\frac{5}{4g}v_0^2$ (b) $\frac{4}{5g}v_0^2$

(c) $\frac{4}{3}v_0^2$ (d) $\frac{3}{5}v_0^2$

Answer – Key

1. b	2. b	3. b	4. b	5. d	6. c	7. c	8. a	9. b	10. c
11. a	12. c	13. d	14. a	15. c	16. d	17. b	18. d	19. c	20. c
21. c	22. d	23. a	24. b	25. b	26. c	27. b	28. d	29. c	30. a
31. b	32. a	33. b	34. c	35. a	36. d	37. c	38. a	39. a	40. c
41. b	42. b	43. c	44. d	45. d	46. b	47. b	48. d	49. d	50. b