1. $\left(\frac{1}{1-2i}+\frac{3}{1+i}\right)\left(\frac{3+4i}{2-4i}\right)$ is equal to :

(a) $\frac{1}{2}+\frac{9}{2}i$ (b) $\frac{1}{2}-\frac{9}{2}i$

(c) $\frac{1}{4}-\frac{9}{4}i$ (d) $\frac{1}{4}+\frac{9}{4}i$

2. $\frac{3+2i\sin\theta}{1-2i\sin\theta}$ will be purely imaginary, if θ is equal to :

(a) $2n\pi \pm \frac{\pi}{3}$ (b) $n\pi + \frac{\pi}{3}$

(c) $n\pi \pm \frac{\pi}{3}$ (d) none of these

3. If three complex number are in A.P., then they lie on :

(a) a circle in the complex plane

(b) a straight line in the complex plane

(c) a parabola in the complex plane

(d) none of these

4. If the cube roots of unity are $1, \omega, \omega^2$, then the roots of the equation $(x-2)^3+27=0$ are :

(a) $-1, -1, -1$

(b) $-1, -\omega, -\omega^2$

(c) $-1, 2+3\omega, 2+3\omega^2$

(d) $-1, 2-3\omega, 2-3\omega^2$

5. 99th term of the series $2+7+14+23+34 \ldots$ is :

(a) 9998 (b) 9999

(c) 10000 (d) 100000

6. If a, b, c, d and p are different real numbers such that

$$(a^2+b^2+c^2)p^2 - 2(ab+bc+cd)p + (b^2+c^2+d^2) \le 0,$$

then a, b, c, d are in :

(a) A.P. (b) G.P.

(c) H.P. (d) none of these

7. The sum of the series $1.3^2+2.5^2+3.7^2+\ldots$ upto 20 terms is :

(a) 188090 (b) 189080

(c) 199080 (d) 199089

8. $\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\ldots+\frac{1}{n(n+1)}$ equals :

(a) $\frac{1}{n(n+1)}$ (b) $\frac{n}{n+1}$

(c) $\frac{2n}{n+1}$ (d) $\frac{2}{n(n+1)}$

9. If $P(x)=ax^2+bx+c$ and $Q(x)=-ax^2+dx+c$, where $ac \ne 0$ then $P(x).Q(x)=0$, has at least :

(a) four real roots

(b) two real roots

(c) four imaginary roots

(d) none of these

10. The solution set of the equation $x^{\log_x(1-x)^2}=9$ is :

(a) $\{-2, 4\}$ (b) $\{4\}$

(c) $\{0, -2, 4\}$ (d) none of these

11. Number of roots of the equation $x-\frac{2}{x-1}=1-\frac{2}{x-1}$, is :

(a) one (b) two

(c) infinite (d) none of these

12. If ${}^nC_{r-1}=36, {}^nC_r=84$ and ${}^nC_{r+1}=126$, then the value of r is :

(a) 1 (b) 2

(c) 3 (d) none of these

13. A student is allowed to select at most n books from a collection of $(2n+1)$ books. If the total number of ways in which he can select one book is 63, then the value of n is equal to :

(a) 2 (b) 3

(c) 4 (d) 1

14. The number of ways in which a committee can be formed of 5 members from 6 men and 4 women if the committee has at least one woman, is :

(a) 186 (b) 246

(c) 252 (d) 244

15. $\sum_{r=0}^{n} {}^{n+r}C_n$ is equal to :

(a) ${}^{n+m+1}C_{n+1}$ (b) ${}^{n+m+2}C_n$

(c) ${}^{n+m+3}C_{n-1}$ (d) none of these

16. The coefficient of x^{-7} in the expansion of $\left[ax - \frac{1}{bx^2}\right]^{11}$ will be :

(a) $\frac{462\,a^6}{b^5}$ (b) $\frac{462\,a^5}{b^6}$

(c) $-\frac{462\,a^5}{b^6}$ (d) $-\frac{462\,a^6}{b^5}$

17. Let n be an odd integer. If $\sin n\theta = \sum_{r=0}^{n} b_r \sin^r\theta$ for every value of θ, then :

(a) $b_0 = 1, b_1 = 3$

(b) $b_0 = 0, b_1 = n$

(c) $b_0 = -1, b_1 = n$

(d) $b_0 = 0, b_1 = n^2 - 3n + 3$

18. $\begin{vmatrix} a+b & a+2b & a+3b \\ a+2b & a+3b & a+4b \\ a+4b & a+5b & a+6b \end{vmatrix}$ is equal to :

(a) $a^2 + b^2 + c^2 - 3abc$

(b) $3ab$

(c) $3a + 5b$

(d) 0

19. If k is a scalar and I is a unit matrix of order 3, then $adj\,(kI)$ is equal to :

(a) k^3I (b) k^2I

(c) $-k^3I$ (d) $-k^2I$

20. The value of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1-x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ is equal to :

(a) $3 - x + y$ (b) $(1-x)(1+y)$

(c) xy (d) $-xy$

21. If $A = \begin{bmatrix} 3 & 2 \\ 0 & 1 \end{bmatrix}$, then $(A^{-1})^3$ is equal to :

(a) $\frac{1}{27}\begin{pmatrix} 1 & -8 \\ 0 & 27 \end{pmatrix}$ (b) $\frac{1}{27}\begin{pmatrix} -1 & 26 \\ 0 & 27 \end{pmatrix}$

(c) $\frac{1}{27}\begin{pmatrix} 1 & -26 \\ 0 & -27 \end{pmatrix}$ (d) $\frac{1}{27}\begin{pmatrix} -1 & -26 \\ 0 & -27 \end{pmatrix}$

22. If $\alpha + \beta - \gamma = \pi$, then $\sin^2\alpha + \sin^2\beta - \sin^2\gamma$ is equal to :

(a) $2 \sin\alpha \sin\beta \cos\gamma$

(b) $2 \cos\alpha \cos\beta \cos\gamma$

(c) $2\sin\alpha \sin\beta \sin\gamma$

(d) none of these

23. If $x \cos\theta = y \cos\left(\theta + \frac{2\pi}{3}\right) = z \cos\left(\theta + \frac{4\pi}{3}\right)$, then the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ is equal to :

(a) 1 (b) 2

(c) 0 (d) $3\cos\theta$

24. In a ΔABC, if $3a = b + c$, then the value of $\cot\frac{B}{2}\cot\frac{C}{2}$ is equal to :

(a) 1 (b) 2

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

25. There exist a triangle ABC, satisfying the conditions :

(a) $b \sin A = a, A < \frac{\pi}{2}$ (b) $b \sin A > a, A > \frac{\pi}{2}$

(c) $b \sin A > a, A < \frac{\pi}{2}$ (d) none of these

26. The number of values of x in the interval $[0, 5\pi]$ satisfying the equation $3\sin^2 x - 7\sin x + 2 = 0$ is :

(a) 0 (b) 5

(c) 6 (d) 10

27. The angle of depression of a ship from the top of a tower 30 m high is 60°. Then the distance of ship from the base of tower is :

(a) 30 m (b) $30\sqrt{3}$ m

(c) $10\sqrt{3}$ m (d) 10 m

28. The area of triangle formed by the points $(a, b+c)$, $(b, c+a)$, $(c, a+b)$ is equal to :

(a) abc (b) $a^2 + b^2 + c^2$

(c) $ab + bc + ca$ (d) 0

29. The points (1, 3) and (5, 1) are the opposite vertices of a rectangle. The other two vertices lie on the line $y = 2x + c$, then the value of c will be :
(a) 4 (b) – 4
(c) 2 (d) –2

30. Given the four lines with equations $x + 2y = 3$, $3x + 4y = 7$, $2x + 3y = 4$ and $4x + 5y = 6$, then these lines are :
(a) concurrent
(b) perpendicular
(c) the sides of a rectangle
(d) none of these

31. The angle between the lines $xy = 0$ is equal to :
(a) 45° (b) 60°
(c) 90° (d) 180°

32. The equation to a pair of opposite sides of a parallelogram are $x^2 - 5x + 6 = 0$ and $y^2 - 6y + 5 = 0$, the equation to its diagonals are :
(a) $x + 4y = 13$ and $y = 4x - 7$
(b) $4x + y = 13$ and $4y = x - 7$
(c) $4x + y = 13$ and $y = 4x - 7$
(d) $y - 4x = 13$ and $y + 4x = 7$

33. The equation of the chord of the circle, $x^2 + y^2 = a^2$ having (x_1, y_1) as its mid-point, is :
(a) $xy_1 + yx_1 = a^2$
(b) $x_1 + y_1 = a$
(c) $xx_1 + yy_1 = x_1^2 + y_1^2$
(d) $xx_1 + yy_1 = a^2$

34. A circle of radius 5 touches another circle $x^2 + y^2 - 2x - 4y - 20 = 0$ at (5, 5), then its equation is :
(a) $x^2 + y^2 + 18x + 16y + 120 = 0$
(b) $x^2 + y^2 - 18x - 16y + 120 = 0$
(c) $x^2 + y^2 - 18x + 16y + 120 = 0$
(d) none of these

35. The equation of the latus-rectum of the parabola $x^2 + 4x + 2y = 0$ is equal to :
(a) $2y + 3 = 0$ (b) $3y = 2$
(c) $2y = 3$ (d) $3y + 2 = 0$

36. The length of major and minor axis of an ellipse are 10 and 8 respectively and its major axis along the y-axis the equation of the ellipse referred to its centre as origin is :
(a) $\frac{x^2}{25} + \frac{y^2}{16} = 1$ (b) $\frac{x^2}{16} + \frac{y^2}{25} = 1$
(c) $\frac{x^2}{100} + \frac{y^2}{64} = 1$ (d) $\frac{x^2}{64} + \frac{y^2}{100} = 1$

37. The point of intersection of tangents at the ends of the latus-rectum of the parabola $y^2 = 4x$ is equal to :
(a) (1, 0) (b) (–1, 0)
(c) (0, 1) (d) (0, –1)

38. Eccentricity of the parabola $x^2 - 4x - 4y + 4 = 0$ is equal to :
(a) $e = 0$
(b) $e = 1$
(c) $e > 4$
(d) $e = 4$

39. The angle between the lines $\frac{x}{1} = \frac{y}{0} = \frac{z}{-1}$ and $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$ is equal to :
(a) $\cos^{-1}\left(\frac{1}{5}\right)$ (b) $\cos^{-1}\left(\frac{1}{3}\right)$
(c) $\cos^{-1}\left(\frac{1}{2}\right)$ (d) $\cos^{-1}\left(\frac{1}{4}\right)$

40. $(a - b) . \{(b - c) \times (c - a)\}$ is equal to :
(a) $2a.b \times c$
(b) $a.b \times c$
(c) 0
(d) $a.b$

41. If the points whose position vectors are $3\hat{i} - 2\hat{j} - \hat{k}$, $2\hat{i} + 3\hat{j} - 4\hat{k}$, $-\hat{i} + \hat{j} + 2\hat{k}$ and $4\hat{i} + 5\hat{j} + \lambda\hat{k}$ lie on a plane, then λ is equal to :
(a) $-\frac{146}{17}$ (b) $\frac{146}{17}$
(c) $-\frac{17}{146}$ (d) $\frac{17}{146}$

42. If $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$ and $(1, a, a^2)$ $(1, b, b^2)$ and $(1, c, c^2)$ are non-coplanar vectors, then abc is equal to :

(a) -1 (b) 0

(c) 1 (d) 4

43. In ΔABC, if $2\overrightarrow{AC} = 3\overrightarrow{CB}$, then $2\overrightarrow{OA} + 3\overrightarrow{OB}$ equals :

(a) $5\overrightarrow{OC}$ (b) $-\overrightarrow{OC}$

(c) $\overrightarrow{OC}$ (d) $4\overrightarrow{OC}$

44. Let $\vec{a} = 2\hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ and a unit vector $\vec{c}$ be coplanar, if $\vec{c}$ is perpendicular to $\vec{a}$, then $\vec{c}$ is equal to :

(a) $\frac{1}{\sqrt{2}}(-\hat{j} + \hat{k})$ (b) $\frac{1}{\sqrt{3}}(-\hat{i} - \hat{j} - \hat{k})$

(c) $\frac{1}{\sqrt{5}}(\hat{i} - 2\hat{j})$ (d) $\frac{1}{\sqrt{3}}(\hat{i} - \hat{j} - \hat{k})$

45. $\lim_{x \to 1} (1 - x) \tan\left(\frac{\pi x}{2}\right)$ is equal to :

(a) $\frac{\pi}{2}$ (b) π (c) $\frac{2}{\pi}$ (d) 0

46. If $f(x) = \frac{\sin [x]}{[x]}$, when $[x] \neq 0$, where $[x]$ is greatest integer function, then $\lim_{x \to 0} f(x)$ is equal to :

(a) -1 (b) 1

(c) does not exist (d) none of these

47. The function $f(x) = |px - q| + r|x|$, $x \in (-\infty, \infty)$ where $p > 0, q > 0$, $r > 0$ assumes its minimum value only at one point, if :

(a) $p \neq q$ (b) $q \neq r$

(c) $r \neq p$ (d) $p = q = r$

48. $\lim_{x \to 1} \frac{\sqrt{1 - \cos 2(x-1)}}{x - 1}$:

(a) exists and is equals $\sqrt{2}$

(b) exists and is equals $-\sqrt{2}$

(c) does not exist becouse $x - 1 \to 0$

(d) does not exist because left hand limit is not equal to right hand limit

49. Differential coefficient of $\sec^{-1}\frac{1}{2x^2 - 1}$ with respect to $\sqrt{1 - x^2}$ at $x = \frac{1}{2}$ is equal to :

(a) 2 (b) 4

(c) 6 (d) 1

50. The function $f(x) = \sin^4 x + \cos^4 x$ increases, if :

(a) $0 < x < \frac{\pi}{8}$ (b) $\frac{\pi}{4} < x < \frac{3\pi}{8}$

(c) $\frac{3\pi}{8} < x < \frac{5\pi}{8}$ (d) $\frac{5\pi}{8} < x < \frac{3\pi}{4}$

51. $\int \sqrt{1 + \sin \frac{x}{2}}\, dx$ is equal to :

(a) $\frac{1}{4}\left[\cos \frac{x}{4} - \sin \frac{x}{4}\right] + c$

(b) $4\left[\cos \frac{x}{4} - \sin \frac{x}{4}\right] + c$

(c) $4\left[\sin \frac{x}{4} - \cos \frac{x}{4}\right] + c$

(d) $4\left[\sin \frac{x}{4} + \cos \frac{x}{4}\right] + c$

52. Area bounded by the curve $x^2 = 4y$ and the straight line $x = 4y - 2$, is equal to :

(a) $\frac{8}{9}$ sq. units (b) $\frac{9}{8}$ sq. units

(c) $\frac{4}{3}$ sq. units (d) none of these

53. The solution of the differential equation $(x^2 - yx^2)\frac{dy}{dx} + y^2 + xy^2 = 0$ is :

(a) $\log\left(\frac{x}{y}\right) = \frac{1}{x} + \frac{1}{y} + c$

(b) $\log\left(\frac{y}{x}\right) = \frac{1}{x} + \frac{1}{y} + c$

(c) $\log(xy) = \frac{1}{x} + \frac{1}{y} + c$

(d) $\log(xy) + \frac{1}{x} + \frac{1}{y} = c$

54. In a binomial distribution, mean is 3 and standard deviation is $\frac{3}{2}$, then the probability distribution is :

(a) $\left(\frac{3}{4}+\frac{1}{4}\right)^{12}$

(b) $\left(\frac{1}{4}+\frac{3}{4}\right)^{12}$

(c) $\left(\frac{1}{4}+\frac{3}{4}\right)^{9}$

(d) $\left(\frac{3}{4}+\frac{1}{4}\right)^{9}$

55. The probability of India winning a test match against Westindies is $\frac{1}{2}$ assuming independence from match to match the probability that in a 5 match series India's second win occurs at the third test, is :

(a) 2/3 (b) 1/2
(c) 1/4 (d) 1/8

56. If both the regression lines intersect perpendicularly, then :

(a) $r<-1$ (b) $r=-1$
(c) $r=0$ (d) $r=\frac{1}{2}$

57. If $\overline{x}=\overline{y}=0$, $\Sigma x_i y_i=12$, $\sigma_x=2$, $\sigma_y=3$, and $n=10$, then the coefficient of correlation is :

(a) 0.1 (b) 0.3
(c) 0.2 (d) 0.1

58. For any two independent events E_1 and E_2, $P\{(E_1 \cup E_2) \cap (\overline{E}_1 \cap \overline{E}_2)$ is equal to :

(a) $\le \frac{1}{4}$

(b) $> \frac{1}{4}$

(c) $\ge \frac{1}{2}$

(d) none of these

59. The degree of the differential equation $\frac{d^2y}{dx^2}+\sqrt{1+\left(\frac{dy}{dx}\right)^3}=0$ is equal to :

(a) 1 (b) 2
(c) 3 (d) 6

60. $\int_1^e \frac{1}{x}dx$ is equal to :

(a) ∞
(b) 0
(c) 1
(d) $\log(1+e)$

Answer – Key

1. d	2. c	3. b	4. d	5. a	6. b	7. a	8. b	9. b	10. a
11. d	12. c	13. b	14. b	15. a	16. b	17. b	18. d	19. b	20. d
21. a	22. a	23. c	24. b	25. a	26. c	27. c	28. d	29. b	30. d
31. c	32. b	33. c	34. b	35. c	36. b	37. b	38. b	39. a	40. c
41. a	42. a	43. a	44. a	45. c	46. c	47. d	48. d	49. b	50. b
51. c	52. b	53. a	54. a	55. c	56. c	57. c	58. a	59. b	60. c