

1. If F is function such that $F(0) = 2$, $F(1) = 3$,
 $F(x+2) = 2F(x) - F(x+1)$ for $x \geq 0$, then
 $F(5)$ is equal to

- (a) -7 (b) -3
(c) 17 (d) 13

2. Let S be a set containing n elements. Then,
number of binary operations on S is

- (a) n^n (b) 2^{n^2}
(c) n^{n^2} (d) n^2

3. The numerically greatest term in the
expansion of $(3 - 5x)^{11}$ when $x = \frac{1}{5}$, is

- (a) 55×3^9 (b) 55×3^6
(c) 45×3^9 (d) 45×3^6

4. The number of solutions of the equation
 $\sin(e^x) = 5^x + 5^{-x}$, is

- (a) 0 (b) 1
(c) 2 (d) infinitely many

5. If $a^x = b^y = c^z = d^u$ and a, b, c, d are in GP,
then x, y, z, u are in

- (a) AP (b) GP
(c) HP (d) None of these

6. If z satisfies the equation $|z| - z = 1 + 2i$, then
 z is equal to

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

7. If $z = \frac{1-i\sqrt{3}}{1+i\sqrt{3}}$, then $\arg(z)$ is
 (a) 60° (b) 120°
 (c) 240° (d) 300°
8. If $f(x) = \sqrt{\log_{10} x^2}$. The set of all values of x for which $f(x)$ is real, is
 (a) $[-1, 1]$
 (b) $[1, \infty)$
 (c) $(-\infty, -1]$
 (d) $(-\infty, -1] \cup [1, \infty)$
9. For what values of m can the expression
 $2x^2 + mxy + 3y^2 - 5y - 2$
 be expressed as the product of two linear factors?
 (a) 0 (b) ± 1
 (c) ± 7 (d) 49
10. If B is a non-singular matrix and A is a square matrix, then $\det(B^{-1}AB)$ is equal to
 (a) $\det(A^{-1})$ (b) $\det(B^{-1})$
 (c) $\det(A)$ (d) $\det(B)$
11. If $f(x), g(x)$ and $h(x)$ are three polynomials of degree 2 and

$$\Delta(x) = \begin{vmatrix} f(x) & g(x) & h(x) \\ f'(x) & g'(x) & h'(x) \\ f''(x) & g''(x) & h''(x) \end{vmatrix},$$

 then $\Delta(x)$ is a polynomial of degree
 (a) 2 (b) 3
 (c) 0 (d) atmost 3
12. The chances of defective screws in three boxes A, B, C are $\frac{1}{5}, \frac{1}{6}, \frac{1}{7}$ respectively. A box is selected at random and a screw drawn from it at random is found to be defective. Then, the probability that it came from box A , is
 (a) $\frac{16}{29}$ (b) $\frac{1}{15}$
 (c) $\frac{27}{59}$ (d) $\frac{42}{107}$
13. The value of $\frac{\cos \theta}{1 + \sin \theta}$ is equal to
 (a) $\tan\left(\frac{\theta}{2} - \frac{\pi}{4}\right)$ (b) $\tan\left(-\frac{\pi}{4} - \frac{\theta}{2}\right)$
 (c) $\tan\left(\frac{\pi}{4} - \frac{\theta}{2}\right)$ (d) $\tan\left(\frac{\pi}{4} + \frac{\theta}{2}\right)$
14. If $3 \sin \theta + 5 \cos \theta = 5$, then the value of $5 \sin \theta - 3 \cos \theta$ is equal to
 (a) 5 (b) 3
 (c) 4 (d) None of these
15. The principal value of $\sin^{-1}\left\{\sin \frac{5\pi}{6}\right\}$ is
 (a) $\frac{\pi}{6}$ (b) $\frac{5\pi}{6}$
 (c) $\frac{7\pi}{6}$ (d) None of these
16. A rod of length l slides with its ends on two perpendicular lines. Then, the locus of its mid point is
 (a) $x^2 + y^2 = \frac{l^2}{4}$ (b) $x^2 + y^2 = \frac{l^2}{2}$
 (c) $x^2 - y^2 = \frac{l^2}{4}$ (d) None of these
17. The equation of straight line through the intersection of line $2x + y = 1$ and $3x + 2y = 5$ and passing through the origin is
 (a) $7x + 3y = 0$ (b) $7x - y = 0$
 (c) $3x + 2y = 0$ (d) $x + y = 0$
18. The line joining $(5, 0)$ to $(10 \cos \theta, 10 \sin \theta)$ is divided internally in the ratio $2 : 3$ at P . If θ varies, then the locus of P is
 (a) a straight line
 (b) a pair of straight lines
 (c) a circle
 (d) None of the above
19. If $2x + y + k = 0$ is a normal to the parabola $y^2 = -8x$, then the value of k , is
 (a) 8 (b) 16
 (c) 24 (d) 32
20. $\lim_{n \rightarrow \infty} \left[\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \dots + \frac{1}{n(n+1)} \right]$
 is equal to
 (a) 1 (b) -1
 (c) 0 (d) None of these
21. The condition that the line $lx + my = 1$ may be normal to the curve $y^2 = 4ax$, is
 (a) $al^3 - 2alm^2 = m^2$
 (b) $al^2 + 2alm^3 = m^2$
 (c) $al^3 + 2alm^2 = m^3$
 (d) $al^3 + 2alm^2 = m^2$

22. If $\int f(x) dx = f(x)$, then $\int \{f(x)\}^2 dx$ is equal to
 (a) $\frac{1}{2} \{f(x)\}^2$ (b) $\{f(x)\}^3$
 (c) $\frac{\{f(x)\}^3}{3}$ (d) $\{f(x)\}^2$
23. $\int \sin^{-1} \left\{ \frac{(2x+2)}{\sqrt{4x^2+8x+13}} \right\} dx$ is equal to
 (a) $(x+1) \tan^{-1} \left(\frac{2x+2}{3} \right) - \frac{3}{4} \log \left(\frac{4x^2+8x+13}{9} \right) + c$
 (b) $\frac{3}{2} \tan^{-1} \left(\frac{2x+2}{3} \right) - \frac{3}{4} \log \left(\frac{4x^2+8x+13}{9} \right) + c$
 (c) $(x+1) \tan^{-1} \left(\frac{2x+2}{3} \right) - \frac{3}{2} \log (4x^2+8x+13) + c$
 (d) $\frac{3}{2} (x+1) \tan^{-1} \left(\frac{2x+2}{3} \right) - \frac{3}{4} \log (4x^2+8x+13) + c$
24. If the equation of an ellipse is $3x^2 + 2y^2 + 6x - 8y + 5 = 0$, then which of the following are true?
 (a) $e = \frac{1}{\sqrt{3}}$
 (b) centre is $(-1, 2)$
 (c) foci are $(-1, 1)$ and $(-1, 3)$
 (d) All of the above
25. The equation of the common tangents to the two hyperbolas $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$, are
 (a) $y = \pm x \pm \sqrt{b^2 - a^2}$
 (b) $y = \pm x \pm \sqrt{a^2 - b^2}$
 (c) $y = \pm x \pm \sqrt{a^2 + b^2}$
 (d) $y = \pm x \pm (a^2 - b^2)$
26. Domain of the function $f(x) = \log_x \cos x$, is
 (a) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right) - \{1\}$ (b) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{1\}$
 (c) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (d) None of these
27. Range of the function $y = \sin^{-1} \left(\frac{x^2}{1+x^2} \right)$, is
 (a) $\left(0, \frac{\pi}{2}\right)$ (b) $\left[0, \frac{\pi}{2}\right)$
 (c) $\left[0, \frac{\pi}{2}\right]$ (d) $\left[0, \frac{\pi}{2}\right]$
28. If $x = \sec \theta - \cos \theta$, $y = \sec^n \theta - \cos^n \theta$, then $(x^2 + 4) \left(\frac{dy}{dx} \right)^2$ is equal to
 (a) $n^2 (y^2 - 4)$ (b) $n^2 (4 - y^2)$
 (c) $n^2 (y^2 + 4)$ (d) None of these
29. If $y = \sqrt{x + \sqrt{y + \sqrt{x + \sqrt{y + \dots}}}}$, then $\frac{dy}{dx}$ is equal to
 (a) $\frac{y+x}{y^2-2x}$ (b) $\frac{y^3-x}{2y^2-2xy-1}$
 (c) $\frac{y^3+x}{2y^2-x}$ (d) None of these
30. If $\int_1^x \frac{dt}{|t|\sqrt{t^2-1}} = \frac{\pi}{6}$, then x can be equal to
 (a) $\frac{2}{\sqrt{3}}$ (b) $\sqrt{3}$
 (c) 2 (d) None of these
31. The area bounded by the curve $y = |\sin x|$, x -axis and the lines $|x| = \pi$, is
 (a) 2 sq unit (b) 1 sq unit
 (c) 4 sq unit (d) None of these
32. The degree of the differential equation of all curves having normal of constant length c is
 (a) 1 (b) 3
 (c) 4 (d) None of these
33. If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$, then $\vec{a} + t\vec{b}$ is perpendicular to \vec{c} , if t is equal to
 (a) 2 (b) 4
 (c) 6 (d) 8

34. The distance between the line $\vec{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - \hat{j} + 4\hat{k})$ and the plane $\vec{r} \cdot (\hat{i} + 5\hat{j} + \hat{k}) = 5$, is
- (a) $\frac{10}{3}$ (b) $\frac{10}{\sqrt{3}}$
 (c) $\frac{10}{3\sqrt{3}}$ (d) $\frac{10}{9}$
35. The equation of sphere concentric with the sphere $x^2 + y^2 + z^2 - 4x - 6y - 8z - 5 = 0$ and which passes through the origin, is
- (a) $x^2 + y^2 + z^2 - 4x - 6y - 8z = 0$
 (b) $x^2 + y^2 + z^2 - 6y - 8z = 0$
 (c) $x^2 + y^2 + z^2 = 0$
 (d) $x^2 + y^2 + z^2 - 4x - 6y - 8z - 6 = 0$
36. If the lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$ intersect, then the value of k , is
- (a) $\frac{3}{2}$ (b) $\frac{9}{2}$
 (c) $-\frac{2}{9}$ (d) $-\frac{3}{2}$
37. The two curves $y = 3^x$ and $y = 5^x$ intersect at an angle
- (a) $\tan^{-1}\left(\frac{\log 3 - \log 5}{1 + \log 3 \log 5}\right)$
 (b) $\tan^{-1}\left(\frac{\log 3 + \log 5}{1 - \log 3 \log 5}\right)$
 (c) $\tan^{-1}\left(\frac{\log 3 + \log 5}{1 + \log 3 \log 5}\right)$
 (d) $\tan^{-1}\left(\frac{\log 3 - \log 5}{1 - \log 3 \log 5}\right)$
38. The equation $\lambda x^2 + 4xy + y^2 + \lambda x + 3y + 2 = 0$ represents a parabola, if λ is
- (a) 0 (b) 1
 (c) 2 (d) 4
39. If two circles $2x^2 + 2y^2 - 3x + 6y + k = 0$ and $x^2 + y^2 - 4x + 10y + 16 = 0$ cut orthogonally, then the value of k is
- (a) 41 (b) 14
 (c) 4 (d) 1
40. If $A(-2, 1)$, $B(2, 3)$ and $C(-2, -4)$ are three points. Then, the angle between BA and BC is
- (a) $\tan^{-1}\left(\frac{2}{3}\right)$ (b) $\tan^{-1}\left(\frac{3}{2}\right)$
 (c) $\tan^{-1}\left(\frac{1}{3}\right)$ (d) $\tan^{-1}\left(\frac{1}{2}\right)$

Answer Key

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