

(ii) If one of the roots of the equation is $2 + \sqrt{5}$, then the equation is

(a) $x^2 - 4x - 1 = 0$

(b) $x^2 - 4x + 1 = 0$

(c) $x^2 + 4x - 1 = 0$

(d) None of these.

(iii) If $\begin{vmatrix} 2 & k \\ 4 & 7 \end{vmatrix} = 2$, the value of k is

(a) 4

(b) 3

(c) 2

(d) None of these.

(iv) If $A = \begin{pmatrix} 3 & 1 \\ 0 & 4 \end{pmatrix}$, then A^2 is

(a) $\begin{pmatrix} 9 & 7 \\ 0 & 16 \end{pmatrix}$

(b) $\begin{pmatrix} 7 & 9 \\ 16 & 0 \end{pmatrix}$

(c) $\begin{pmatrix} 7 & 16 \\ 9 & 0 \end{pmatrix}$

(d) None of these.

(v) If the matrix $\begin{pmatrix} a & 3 \\ a & 2 \end{pmatrix}$ is singular, then the

value of a is

- (a) 1
- (b) 2
- (c) 0
- (d) -1.

(vi) The value of $\tan 135^\circ$ is

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

(vii) If $\sin A = 3/5$, then the value of $\cos A$ is

- (a) $4/5$
- (b) $2/5$
- (c) $\pm 4/5$
- (d) None of these.

2. (a) Solve :

$$x^y = y^x$$

$$x = 2y.$$

3

(b) If $3 + \sqrt{5}$ is a root of the equation $x^2 - px + q = 0$, show that $p:q = 3:2$. 4

(c) If α, β are the roots of the equation $x^2 - px + q = 0$, then form the quadratic equation whose roots are $\alpha + 1/\beta$ and $\beta + 1/\alpha$. 5

3. (a) Solve by Cramer's rule : 4

$$x + y + z = 3$$

$$x + 2y + 3z = 4$$

$$x + 4y + 9z = 6.$$

(b) Show that
$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = (a - b)(b - c)$$

$(c - a)(a + b + c)$. 4

(c) Find x, y, z and w , given that 4

$$3 \begin{pmatrix} x & y \\ z & w \end{pmatrix} = \begin{pmatrix} x & 6 \\ -1 & 2w \end{pmatrix} + \begin{pmatrix} 4 & x+y \\ 2+w & 3 \end{pmatrix}.$$

4. (a) If $A = \begin{pmatrix} -3 & 5 & 7 \\ 3 & -5 & -7 \\ -3 & 5 & 7 \end{pmatrix}$, $I = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$, prove

that $A(A + I) = 0$.

4

(b) If $A = \begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$, find A^{-1} .

4

(c) If $A = \begin{pmatrix} 4 & 2 \\ -1 & 1 \end{pmatrix}$, find $A^2 - 5A + 6I$.

4

5. (a) Show that $\cos \theta + \sin (270^\circ - \theta) - \sin (270^\circ - \theta) + \cos (180^\circ + \theta) = 0$.

3

(b) Show that for any triangle ABC:

5

(i) $\sin(A + B) = \sin C$

(ii) $\cos\left(\frac{A+B}{2}\right) = \sin\frac{C}{2}$.

(c) Show that

4

$$\frac{\sin 2A - \sin 3A + \sin 5A - \sin 7A}{\cos A - \cos 3A - \cos 5A + \cos 7A} = \cot 2A$$

SECTION - B

6. For each of the following questions four answers are provided of which one is correct. Choose the correct answer in each case : $2 \times 7 = 14$

(i) The distance of the point (3, 3) from the origin is

- (a) 3
- (b) 9
- (c) 0
- (d) None of these.

(ii) The equation of the straight line passes through the points (-1, -1) and (1, 1) is

- (a) $y = x$
- (b) $y + x = 1$
- (c) $y - 1 = x + 1$
- (d) None of these.

(iii) The mode of the series 2, 2, 1, 5, 4, 3, 3, 8, 3 is

- (a) 2
- (b) 4
- (c) 3
- (d) None of these.

(iv) $\lim_{x \rightarrow 2} (4x - 8)$ is equal to

- (a) 0
- (b) -8
- (c) 2
- (d) None of these.

(v) If $y = x^4 + 7x^3 + 8x^2 + 3x - 2$, the value of $\frac{dy}{dx}$ at $x = 1$ is

- (a) 2
- (b) 44
- (c) 8
- (d) None of these.

(vi) The value of $\int_0^1 (x^3 + 1) dx$ is

- (a) $5/4$
- (b) $4/5$
- (c) $3/4$
- (d) None of these.

(vii) The value of $\int_0^{\pi/2} \cos x dx$ is

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

7. (a) A line is of length 10 units and one of its ends is $(-2, 3)$. If the ordinate of the other end is 9, prove that the abscissa of the other end is either 6 or -10 . 3

(b) Find the area of the triangle whose vertices are $(1,6)$, $(3,0)$ and $(-3, -7)$. 3

(c) Reduce the equation $\sqrt{3}x + y - 4 = 0$ to

(i) slope-intercept form and find its slope and y-intercept.

(ii) Normal form and find the values of p and α ? 6

8. (a) Differentiate the following functions w.r.t.x : 2×3=6

(i) $\cos x + 4 \tan x - 3 \sin x,$

(ii) $\frac{\sin x}{1 - \cos x}$

(iii) $x e^{2x}$

(b) If $y = x + \frac{1}{x}$, show that $x^2 \frac{dy}{dx} - xy + 2 = 0.$ 3

(c) If $x^2 + y^2 + 4x - 10 = 0$, find $\frac{dy}{dx}$ at $x = 1.$ 3

9 (a) Find (any three) : 3×3=9

(i) $\int \frac{2x+3}{x^2+3x+5} dx$

(ii) $\int e^x \cos x dx$

(iii) $\int \frac{x}{(x+1)(x+3)(x+5)} dx$

(iv) $\int_0^{\pi/2} \frac{1}{1+\cos x} dx$

(b) Evaluate (any one) : 3

(i) $\int_0^{\pi/2} \log \tan x \, dx$

(ii) $\int_0^{\pi/2} \frac{\cos x}{\sin x + \cos x} \, dx$

10. (a) The marks obtained by 12 students are 25, 20, 32, 23, 40, 27, 30, 25, 20, 10, 15, 41.

Find the mean and median. 5

(b) Define mode. 2

(c) Find the value of mode for the following series : 5

Class : 1-10 10-20 20-30 30-40

Frequency : 10 21 51 45