

B.Sc. (CBCS Pattern) Semester-V
USMT11 DSE-III - Mathematics-III - Matrices and Theory of Equations

P. Pages : 3

Time : Three Hours



GUG/W/24/13117

Max. Marks : 60

- Notes : 1. Solve all **five** questions.
2. All questions carry equal marks.

UNIT - I

1. a) Reduce the matrix. **6**

$$A = \begin{bmatrix} 2 & 1 & -3 & -6 \\ 3 & -3 & 1 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}$$

to the normal form.

- b) Find the rank of the matrix. **6**

$$\begin{bmatrix} 1 & 2 & -1 & 3 \\ 4 & 1 & 2 & 1 \\ 3 & -1 & 1 & 2 \\ 1 & 2 & 0 & 1 \end{bmatrix}$$

OR

- c) Find the rank of- **6**

$$A = \begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 9 \\ 1 & 3 & 4 & 0 \end{bmatrix}$$

- d) **6**

$$\text{If } A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$$

find two non singular matrices P and Q such that $PAQ=I$ also find the rank of A.

UNIT - II

2. a) Find all non trivial solutions of- **6**

i) $x - 2y + 3z = 0$
 $2x + 5y + 6z = 0$

ii) $x - 2y + z = 0$
 $x - 2y - z = 0$
 $2x - 4y - 5z = 0$

- b) Investigate for what values of λ, μ the equations. 6
- $$x + y + z = 6$$
- $$x + 2y + 3z = 10$$
- $$x + 2y + \lambda z = \mu$$
- have
- i) no solution ii) A unique solution
- iii) An infinitely many solutions

OR

- c) Solve by Gauss-Jordan elimination method- 6
- $$x - y + z = 2, 2x + y + 2z = 1, x + y + z = 0$$
- d) Find the eigen values and corresponding eigen vectors at the matrix 6
- $$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

UNIT - III

3. a) Solve $x^3 - 12x^2 + 39x - 28 = 0$, roots being in AP. 6
- b) Determine the values of the following symmetric functions for the cubic equation. 6
- $$x^3 + px^2 + qx + r = 0 \text{ whose roots are } \alpha, \beta, \gamma$$
- i) $\Sigma \alpha^2$ ii) $\Sigma \alpha^2 \beta$
- iii) $\Sigma \alpha^2 \beta^2$

OR

- c) Solve $4x^4 - 20x^3 + 33x^2 - 20x + 4 = 0$. 6
- d) If α, β, γ are the roots of $x^3 + 2x^2 - 3x - 1 = 0$, find the value of $\frac{1}{\alpha^3} + \frac{1}{\beta^3} + \frac{1}{\gamma^3}$ 6

UNIT - IV

4. a) Solve the equation $x^3 - 21x - 344 = 0$ by using Cardon's method. 6
- b) Solve $x^3 - 15x^2 - 33x + 847 = 0$ by Cardon's method. 6

OR

c) Solve $x^4 + 8x^3 + 9x^2 - 8x - 10 = 0$. 6

d) Solve $x^4 - 2x^3 - 5x^2 + 10x - 3 = 0$ by using Descarts method. 6

5. Attempt any six.

i) Define symmetric matrix with example. 2

ii) Define rank of matrix. 2

iii) State condition of consistency. 2

iv) Find the eigen values of- 2

$$A = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$$

v) Solve $x^4 - x^2 - 2 = 0$ 2

vi) Find the sum of the cubes of the roots of the equation. 2

$$x^3 - 6x^2 + 11x - 6 = 0$$

vii) Remove the fractional coefficients from the equation. 2

$$x^3 - \frac{1}{2}x^2 + \frac{2}{3}x - 1 = 0$$

viii) If a, b, c are the roots of the equation $x^3 + px^2 + qx + r = 0$ find the equation whose roots are ab, bc and ac. 2
