

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

P. Pages : 2

Time : Three Hours



GUG/S/23/13117

Max. Marks : 60

- Notes :
1. Solve all **five** question.
 2. Que. No. 1 to 4 has an alternative. Solve each question in full or its alternative In full.
 3. All question carry equal marks.

UNIT – I

1. a) $\text{If } A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 4 & 0 \\ -2 & 6 & 1 \end{bmatrix}$ then find the adjoint of matrix A. **6**
- b) $\text{If } A = \begin{bmatrix} 2 & 1 \\ -3 & 5 \end{bmatrix}$ then show that A is non singular and find adjoint and inverse of A. **6**

OR

- c) Find rank of matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 1 & -2 & 2 \\ 3 & 2 & 0 \end{bmatrix}$ **6**
- d) Reduce the matrix $A = \begin{bmatrix} 2 & 1 & -3 & -6 \\ 3 & -3 & 1 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}$ in the normal form. **6**

UNIT – II

2. a) Find all non-trivial solution of $x - 2y + z = 0$, $x - 2y - z = 0$, $2x - 4y - 5z = 0$ **6**
- b) Solve the linear equations $2x + 3y - z = 0$, $x - y + 2z = 5$, $3x + y - z = 1$ by matrix method. **6**

OR

- c) Show that λ is eigen value of non-singular matrix A, then λ^{-1} is the eigen value of A^{-1} . **6**
- d) Find the eigen values of the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ **6**

UNIT – III

3. a) Prove that in an equation with real coefficients complex roots occur in pairs. 6
- b) Find the roots of equation $8x^3 + 18x^2 - 27x - 27 = 0$ are in geometric progression. 6

OR

- c) If a, b, c are the roots of equation $x^3 + px^2 + qx + r = 0$, find the values of $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2}$ 6
- d) Find the equation whose roots are the roots of $4x^5 - 2x^3 + 7x - 3 = 0$ each increased by 2. 6

UNIT – IV

4. a) Find the equation whose roots are the negative reciprocals of the roots of $x^4 + 7x^3 + 8x^2 - 9x + 10 = 0$ 6
- b) Solve the Cubic equation by Cardon's method $x^3 + 6x^2 + 9x + 4 = 0$ 6

OR

- c) Solve the equation $x^4 - 10x^3 + 35x^2 - 50x + 24 = 0$ by Ferrari's method. 6
- d) Solve the biquadratic equation $x^4 - 2x^3 - 5x^2 + 10x - 3 = 0$ 6

5. Solve any six.

- a) Define Skew-Hermitian matrix. 2
- b) If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then find $\text{adj } A$. 2
- c) Define consistent system of linear equations. 2
- d) Show the vectors $(1, 0, 0)$, $(0, 1, 0)$, $(0, 0, 1)$ are linearly independent. 2
- e) If $1 + i$ are roots of $x^4 - 2x^3 + 3x^2 - 2x + 2 = 0$ then find the remaining roots. 2
- f) Find the nature of roots of equation $x^2 + 3x + 2 = 0$. 2
- g) Find reciprocal equation of equation $f(x) = x^n + P_1x^{n-1} + P_2x^{n-2} + \dots + P_{n-1}x + P_n = 0$ 2
- h) Reduce the Cubic equation $x^3 + ax^2 + bx + c = 0$ in the standard form. 2
