



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

### UNIT – I

1. a) Show that the matrix  $A = \begin{bmatrix} 1+i & 2 & -2 \\ 0 & i+2 & -1 \\ i & 1 & 0 \end{bmatrix}$  is non singular. Also determine the adjoint of the matrix A. 6

- b) For the matrix  $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$ , find nonsingular matrices P and Q such that PAQ is in the normal form. Hence determine  $A^{-1}$ . 6

### OR

- c) Reduce the matrix  $A = \begin{bmatrix} 3 & 5 & 7 \\ 2 & 3 & 4 \\ 1 & 2 & 3 \end{bmatrix}$  to the normal form and then find it's rank. 6

- d) Find the rank of the matrix  $A = \begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$  6

### UNIT – II

2. a) Solve completely the system of equations. 6  
 $x + 2y - z = 3$   
 $3x - y + 2z = 1$   
 $x - y + z = -1$   
 $2x - 2y + 3z = 2$

- b) Investigate for what values of a, b the equations. 6  
 $x + y + z = 6$   
 $x + 2y + 3z = 10$   
 $x + 2y + az = b$

Have-

- i) No solutions  
ii) A unique solution  
iii) An infinitely many solutions

**OR**

- c) Show that if B be an invertible matrix of the same order as A, then the matrices A and  $B^{-1}AB$  have the same characteristic roots. 6
- d) Find the characteristic equation of the matrix  $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$  and verify Cayley- Hamilton theorem for matrix. 6

**UNIT – III**

3. a) Prove that every equation of degree n has n roots and no more. 6
- b) Solve  $x^4 + 2x^3 - 5x^2 + 6x + 2$  which has a root  $-2 + \sqrt{3}$ . 6

**OR**

- c) Solve the equation  $4x^3 + 20x^2 - 23x + 6 = 0$ , two of its roots being equal. 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) Solve the equation  $x^5 - 5x^4 + 9x^3 - 9x^2 + 5x - 1 = 0$  6
- b) Solve the Cubic equation  $x^3 + 6x^2 + 9x + 4 = 0$  by Cardon's method. 6

**OR**

- c) Solve biquadratic equation  $x^4 - 10x^3 + 35x^2 - 50x + 24 = 0$  by Ferron's method. 6
- d) Solve biquadratic equation  $x^4 - 3x^2 - 42x - 40 = 0$ . By Descartes method. 6

5. Attempt any six.

- a) Define symmetric and skew symmetric matrix. 2
- b) Show that matrix  $A = \begin{bmatrix} 1 & 2 \\ -2 & 3 \end{bmatrix}$  is non-singular. 2
- c) State the condition of consistency of system of equation  $Ay = B$ . 2
- d) Show that if  $\lambda$  is the eigen value of a nonsingular matrix A. then  $\lambda^{-1}$  is eigen value of  $A^{-1}$ . 2
- e) Find the nature of the roots of the equation  $3x^4 + 12x^2 + 5x - 4 = 0$ . 2
- f) Find the equation whose roots are the reciprocals of  $x^4 - 3x^3 + 7x^2 + 5x - 2 = 0$ . 2
- g) Prove that the roots of a reciprocal equation occurs in pairs. 2
- h) Write the standard form of Cubic equation. 2

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