

USMT11 - Mathematics-III - DSE : Matrices and Theory of Equation

P. Pages : 2

Time : Three Hours



GUG/W/22/13117

Max. Marks : 60

- Notes :
1. Solve all the **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) Define, conjugate, Hermitian matrix, and symmetric matrix. 6
- b) If A and B be two $m \times n$ and $n \times p$ matrices respectively then prove that. 6
 $(AB)^T = B^T A^T$. Where T for transpose.

OR

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

- d) Find the rank of matrix A by reducing to the normal form. 6
 $A = \begin{bmatrix} 1 & 1 & -1 & 1 \\ 1 & -1 & 2 & -1 \\ 3 & 1 & 0 & 1 \end{bmatrix}$

UNIT – II

2. a) Find all non – trival solution of 6
 $x - 2y + 3z = 0, 2x + 5y + 6z = 0$

- b) Given, let $Y = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 5 \\ 1 & 3 & 3 \end{bmatrix} X$. Find $X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$ if $Y = \begin{bmatrix} 2 \\ 0 \\ 5 \end{bmatrix}$ 6

OR

- c) If $\lambda_1, \lambda_2, \dots, \lambda_n$ are characteristics roots of an n – square matrix A and K is a scalar, 6
then show that $K\lambda_1, K\lambda_2, \dots, K\lambda_n$ are characteristic roots of KA.

- d) Find the eigen values of the matrix. 6
 $A = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$

UNIT – III

3. a) Form the equation of the fourth degree whose roots are $3 + i$ and $\sqrt{7}$. 6
- b) Solve the equation $6x^3 - 11x^2 - 3x + 2 = 0$. The roots being in harmonic progression. 6

OR

- c) Show that the same transformation removes both 2nd and 4th terms of the equation $x^4 + 16x^3 + 83x^2 + 152x + 84 = 0$ and then find its root. 6
- d) Find the equation whose roots are the roots of $x^4 - 5x^3 + 7x^2 - 17x + 11 = 0$ each diminished by 4. 6

UNIT – IV

4. a) Find the equation whose roots are the reciprocals of $x^4 - 3x^3 + 7x^2 + 5x - 2 = 0$ 6
- b) Solve by Cardon's method $x^3 - 15x = 126$. 6

OR

- c) Solve the cubic equation by Cardon's method $x^3 + 6x^2 + 9x + 4 = 0$. 6
- d) Solve $x^4 - 3x^2 - 42x - 40 = 0$ by Descartes method. 6

5. Solve **any six**.

- a) If $A = \begin{bmatrix} 3 & 1 \\ 2 & 0 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 2 \\ 1 & -1 \end{bmatrix}$ then find $|AB|$ 2
- b) Prove that matrix $\begin{bmatrix} 2 & 1 \\ -5 & 5 \end{bmatrix}$ is nonsingular. 2
- c) Define homogenous system of linear equation. 2
- d) Define row-rank and column rank of matrix. 2
- e) If $f(x) = x^3 - 3x + 2 = 0$, then find the nature of roots of equation. 2
- f) If α, β, γ are the roots of cubic equation $x^3 + px^2 + qx + r = 0$ then find symmetric function $\sum \alpha^2$ 2
- g) Write general form of cubic equation. 2
- h) Write a general form of biquadratic equation. 2
