COURSE CODE (CREDITS): 18B11MA112 (04)

COURSE NAME: BASIC MATHEMATICS-I

COURSE INSTRUCTORS: MDS

MAX. MARKS: 25

MAX. TIME: 1 Hour 30 Minutes

Note: *(a)All questions are compulsory.*

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

---

Q.1 For what values of x, the matrix $\begin{bmatrix} 3-x & 2 & 2 \\ 2 & 4-x & 1 \\ -2 & -4 & -1-x \end{bmatrix}$ is singular? (CO-1) [4]

Q.2 If $A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{bmatrix}$, and I is the identity matrix of order 3, evaluate $A^2 - 3A + 9I$. (CO-1) [4]

Q.3 Find the vector projection of a force $F = 5\hat{i} + 4\hat{j} + \hat{k}$ onto $\vec{V} = 3\hat{i} + 5\hat{j} - 2\hat{k}$ and the scalar component of $\vec{F}$ in the direction of $\vec{V}$. (CO-2) [3]

Q.4 (a) Find the vector, parametric and Cartesian equations for the line through $(-3, 2, -3)$ and $(1, -1, 4)$.

(b) Find the vector equations of the plane which is at a distance of 5 units from the origin and which is normal to the vector $4\hat{i} - 3\hat{j} + 5\hat{k}$. (CO-2) [3+2]

Q.5 Find the shortest distance between the lines (CO-2) [5]

$$\vec{r} = (3\hat{i} + 4\hat{j} - 2\hat{k}) + \lambda(-\hat{i} + 2\hat{j} + \hat{k})$$

and

$$\vec{r} = (\hat{i} - 7\hat{j} - 2\hat{k}) + \mu(\hat{i} + 3\hat{j} + 2\hat{k}).$$

Q.6 Find the real value of x and y if (CO-3) [4]

$$\frac{1}{x + iy} - \frac{1}{1 + i} = 2 - 3i$$