

MID TERM EXAMINATION, SEMESTER I, 1444
DEPT. OF MATH., COLLEGE OF SCIENCE, KSU
MATH: 107 FULL MARK: 30 TIME: 2 HOURS

Q1. [1+4+3=8]

Consider the following system of linear equations

$$x + y + z = 5$$

$$-4x + y + z = 0$$

$$x + y - 4z = 10.$$

- (a) Write the system in the form $AX = B$.
- (b) Find the inverse of the matrix A by elementary matrix method.
- (c) Use A^{-1} to solve the above system.

Q2. [3+3+3=9]

- (a) Evaluate the determinant of B by reducing the matrix to row-echelon form.

$$B = \begin{bmatrix} 1 & 3 & 5 \\ 4 & 14 & 12 \\ -2 & -3 & -20 \end{bmatrix}$$

- (b) Let

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

Find the adjoint of the matrix C .

- (c) By using Cramer's Rule solve the system of equations:

$$4x + 5y = 2$$

$$x + y + 2z = 3$$

$$x + 5y + 2z = 1.$$

Q3. [3+3=6] (a) Let $A(1, 1, 0)$, $B(2, 1, 1)$, $C(1, 2, 1)$, and $D(0, -1, 2)$.

Evaluate (i) the angle between the vector $\vec{AB}$ and $\vec{CD}$,

(ii) the component of $\vec{AB}$ along $\vec{AC}$.

- (b) Find the work done by a constant force $\vec{F} = 2\vec{i} + \vec{j} - 3\vec{k}$ if its point of application moves from $P(1, 3, 6)$ to $Q(3, 4, 5)$.

Q4. [3+4=7]

- (a) Find the volume V of a box having adjacent sides AB , AC , and AD where $A(1, 1, 1)$, $B(1, 0, -1)$, $C(2, 1, 2)$, $D(3, 4, 5)$.

- (b) Find an equation of the plane P determined by the points $A(1, 1, 1)$, $B(1, 0, -1)$, and $C(2, 1, 2)$.