

**SCHOOL OF APPLIED SCIENCE & HUMANITIES**  
**DEPARTMENT OF MATHEMATICS**

Subject: Foundations of Engineering Mathematics  
Sem. : Pre-Semester  
Section: 20

Subject Code: 25MT101  
Academic Year: 2025-2026  
Regulation: R25

**Assignment 3**

**30 Marks**

1. Answer the following:

a. If  $A - B = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$  and  $A + B = \begin{bmatrix} 3 & 4 \\ 2 & 5 \end{bmatrix}$ , then calculate AB.

b. If  $A = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 0 & -1 \end{bmatrix}$ , then calculate AB.

c. If  $\begin{bmatrix} x-2 & x+y \\ z-3 & 12 \end{bmatrix} = \begin{bmatrix} 0 & 3 \\ 4 & 12 \end{bmatrix}$ , then calculate  $x+2y+3z$ .

d. For a given matrix A of order  $m \times n$ , write it as a sum of a symmetric and a skew-symmetric matrix.

e. For a square matrix of order 2, calculate the additive identity, additive inverse, multiplicative identity and multiplicative inverse.

f. If A is a  $3 \times 3$  skew-symmetric matrix, then calculate  $\det(A)$ .

g. If A is a  $3 \times 3$  matrix such that  $A^2 - 5A + 6I = 0$ , find  $A^{-1}$ .

2.

a. Three firms A, B and C supplied 40, 35 and 25 truckloads of stones and 10, 5, 8 truckloads of sand respectively to a contractor. If the costs of stone and sand are 1200/- and 500/- per truck load respectively, find the total amount paid by the contractor to each of these firms, by using matrix method.

b. There are two families A and B. There are 4 men, 6 women and 2 children in family A and 2 men, 2 women, and 4 children in family B. The recommended daily requirement for calories is: Man: 2400, Women: 1900, child: 1800 and for proteins is: Man: 55-gram, Woman: 45 gram and child: 33gram. Represent

the above information by matrices. Using matrix multiplication, calculate the total requirements of calories and proteins for each of the two families.

3. Evaluate  $\lim_{x \rightarrow 0} (\sin 5x / \tan 3x)$ .
4. Find the equation of the tangent and normal to the curve  $y = x^3 - 3x + 2$  at  $x = 1$ .
5. If  $y = x^x$ , find  $dy/dx$ .
6. Verify Rolle's theorem for  $f(x) = x^2 - 4x + 3$  in the interval  $[1, 3]$ .