VIGNAN'S FOUNDATION FOR SCIENCE, TECHNOLOGY & RESEARCH
(Deemed to be University) - Estd. u/s 3 of UGC Act 1956

SCHOOL OF APPLIED SCIENCE & HUMANITIES
DEPARTMENT OF MATHEMATICS

Subject: Foundations of Engineering Mathematics — Subject Code: 25MT101
Sem. : Pre-Semester — Academic Year: 2025-2026
Section: 32 — 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 x 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 3×3 skew-symmetric matrix, then calculate det(A).
   g. If A is a 3×3 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 $\lim_{x \to 0} \frac{\sin 5x}{\tan 3x}$.
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 $\frac{dy}{dx}$.
6. Verify Rolle's theorem for $f(x) = x^2 - 4x + 3$ in the interval $[1, 3]$.