

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B. Tech-I Semester (BT/BI)

COURSE CODE (CREDITS): 25B11MA112 (3)

MAX. MARKS: 25

COURSE NAME: MLS-I

COURSE INSTRUCTOR: P K Pandey

MAX. TIME: 1 Hour 30 Min

Note: (a) All questions are compulsory.

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

(c) Use of calculator is permitted.

Q.No.	Question	CO	Marks
Q1	(a) Verify whether the matrix $\begin{bmatrix} 1/2 & \sqrt{3}/2 \\ \sqrt{3}/2 & -1/2 \end{bmatrix}$ is orthogonal or not? (b) Suppose in a sample the concentrations of RBC, WBC and Platelets are respectively x, y, z units, are related by the equations: $x + 2y + z = 13, y + 2x + z = 12, x + y + 2z = 14$. Using the Cramer's rule solve the above system.	CO1	2+3
Q2	Find the eigenvalues and eigenvectors of matrix $\begin{bmatrix} 2 & 3 \\ 3 & 2 \end{bmatrix}$.	CO2	4
Q3	Verify the Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix}$ and hence obtain A^{-1} (if it exists).	CO2	4
Q4	During a viral outbreak 250 patients were examined in a hospital for sore throat (T), and fever (F). It was observed that 50 patients exhibited a sore throat, 70 exhibited fever, and 20 exhibited both symptoms. Find (i) How many beds does the hospital needs to reserve to admit those patients who have at least one symptom? (ii) How many patients have exactly one symptom.	CO2	4
Q5	The mosquito population $P(t)$ in a locality is given by: $P(t) = 10000 + 5000 \sin \frac{\pi t}{10} - 500 \cos \frac{\pi t}{10}$. Compute the population in the month: (i) January ($t = 0$) (ii) June ($t = 5$).	CO2	4
Q6	Suppose the rate of a biochemical reaction is given by $R(t) = e^{0.05t}$. Using the Taylor series expansion find the linear approximation of $R(t)$ about $t = 37^\circ\text{C}$, and hence compute $R(38)$.	CO3	4
