

J C Bose University of Science and Technology
First sessional Test – September 2025 (Semester: First)
Subject: Mathematics I (BSC-103 RAD)
B. Tech. (Robotics and Artificial Engineering)

Attempt all questions:

1. Show that the following system of equations:

$$3x - y + 4z = 3; \quad x + 2y - 3z = -2; \quad 6x + 5y + \lambda z = -3$$

has at least one solution for any real number λ . Find the set of solutions when $\lambda = -5$.

[4] [CO5]

2. Find the characteristic equation of the matrix A given $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

Hence find A^{-1} .

[5] [CO5]

3. Prove that $\tan^{-1} \beta - \tan^{-1} \alpha < \beta - \alpha$, where $\beta > \alpha$, using Lagrange's mean Value theorem.

[4] [CO2]

4. Test the convergence of the sequence $\{s_n\}$, where $s_n = 2 + (-1)^n$.

[2] [CO3]