

**SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY, RAIPUR**

**DEPARTMENT OF MATHEMATICS**

Class Test – I

Session- July – Dec 2023

Date-30.11.23

Semester- B.Tech-I

Subject- Mathematics-I

Code – A000112(014)

Time Allowed: 2 hrs

Max Marks: 40

Note: - Attempt any five questions.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
1.	Reduce the matrix into normal form and find its rank. $A = \begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$	8	Applying	CO5
2.	For what values of K the equations $x + y + z = 1$ $2x + y + 4z = K$ $4x + y + 10z = K^2$ Have a solution and solve them completely in each case?	8	Applying	CO5
3.	Find the Eigen values and Eigen vectors for following matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$	8	Applying	CO5
4.	(i) Verify Rolle's Theorem for $f(x) = e^x (\sin x - \cos x)$ in $(\pi/4, 5\pi/4)$ . (ii) If $\lim_{x \rightarrow 0} \frac{ae^x - b\cos x + ce^{-x}}{x \sin x} = 2$ , find values of a, b and c.	8	Applying	CO2
5.	Expand $e^{a \sin^{-1} x}$ in ascending powers of x up to the term containing $x^4$	8	Applying	CO2
6.	Use Taylor's series to prove that $\tan^{-1}(x+h) = \tan^{-1} x + (h \sin z) \frac{\sin z}{1} - (h \sin z)^2 \frac{\sin 2z}{2} + (h \sin z)^3 \frac{\sin 3z}{3}$ +.... where $z = \cot^{-1} x$ .	8	Applying	CO2