BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSC | **SEMESTER : I**
BRANCH: MATHS & COMPUTING | **SESSION : MO/2024**

SUBJECT: MA109 MATRIX THEORY

TIME: 3 Hours | **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	If $\boldsymbol{A}$ and $\boldsymbol{B}$ are Hermitian matrices, then show that $\boldsymbol{AB}-\boldsymbol{BA}$ is skew-Hermitian.	[5]	CO1	2
Q.1(b)	If $\boldsymbol{A}$ is a skew-Hermitian matrix, then show that $\boldsymbol{iA}$ is Hermitian.	[5]	CO1	2
Q.2	For what values of λ *and* β do the system of equations: $\boldsymbol{x+y+z=6}$; $\boldsymbol{x+2y+3z=10}$; $\boldsymbol{x+2y+\lambda z=\beta}$ have (i) no solution (ii) unique solution (iii) infinite number of solutions ?	[10]	CO2	3
Q.3(a)	Using the Gauss elimination method, find the solution of the system of equations: $\boldsymbol{x+y+z=2}$; $\boldsymbol{x+3y+2z=5}$; $\boldsymbol{x+y+3z=7}$.	[5]	CO3	3
Q.3(b)	A mapping $\boldsymbol{T}:\boldsymbol{V}\rightarrow\boldsymbol{V}$ defined by $\boldsymbol{T(x,y)=(4x-2y,2x+y)}$. Then show that $\boldsymbol{T}$ is a linear transformation.	[5]	CO3	3
Q.4	Show that the matrix A= $\begin{bmatrix}-1 & 2 & -2\\ 1 & 2 & 1\\ -1 & -1 & 0\end{bmatrix}$ is diagonalizable. Find matrices $\boldsymbol{P}$ and $\boldsymbol{D}$ such that $\boldsymbol{P^{-1}AP=D}$.	[10]	CO4	4
Q.5(a)	Reduce the quadratic $\boldsymbol{3x^2+3z^2+4xy+8xz+8yz}$ into canonical form as $\boldsymbol{D=P'AP}$, where $\boldsymbol{D}$ is diagonal matrix.	[10]	CO5	3

:::::12/12/2024 M:::::