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

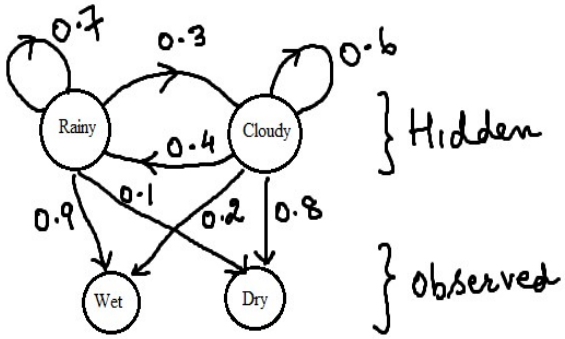
CLASS: B.Tech **SEMESTER: V**
BRANCH: AI **SESSION : MO/2025**

SUBJECT: AI203 MATHEMATICS FOR DATA SCIENCE

TIME: 2 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q1(a)	Write a note on the utility of Gramian matrix.	[2]	1	2
Q1(b)	Define Fiedler value and its use in Graph partitioning.	[3]	1	2
Q2(a)	Define the use of Iso-perimetric number in Graph partitioning.	[2]	2	2
Q2(b)	Explain the reason that a Laplace Matrix of a graph has a zero eigen value. What does it mean that a Laplace matrix has two eigen values equal to zero.	[3]	2	3
Q3	Markov Model is Given as	[5]	3	5



$$\text{Initial} \begin{bmatrix} \text{Rainy} \\ \text{Sunny} \end{bmatrix} = \begin{bmatrix} 0.6 \\ 0.4 \end{bmatrix}$$

Find the Probability of Sequence Wet, Wet, Dry using Forward Algorithm.

Q4	Using the Markov Model given in **Question 3**, say observed sequence is "wet, wet, dry". What is the probability of hidden sequence Rainy, Cloudy, Rainy.	[5]	4	4
Q5	Find the eigen values and eigen vectors of Symmetric matrix $A = \begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$ And hence diagonalize the Matrix A .	[5]	5	3

:::::18/09/2025:::::M