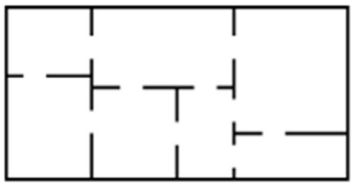
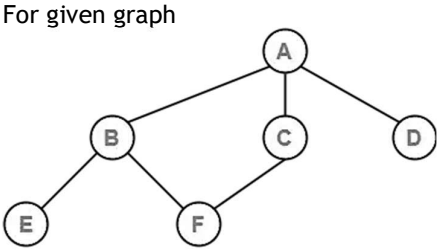
BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)

CLASS: BTECH **SEMESTER : IV**
BRANCH: AI & ML **SESSION : SP/2025**

SUBJECT: AI203 MATHEMATICS FOR DATA SCIENCE

TIME: 02 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**
5. If you find any discrepancy in the question, please mention it in your answer sheet. Discrepancies not mentioned in the answer sheet will not be considered later.

			CO	BL
Q.1(a)	Edward A. Mouse has just finished his brand new house. The floor plan is shown below:  Edward wants to give a tour of his new pad to a lady-mouse-friend. 1. Construct a graph corresponding to the maze given above. 2. Is it possible for Edward and friends to walk through every doorway exactly once? 3. If so, in which rooms must they begin and end the tour? 4. Explain.	[0.5+0.5+ 0.5+ 0.5=2]	1	4
Q.1(b)	For given graph  1. Represent it as adjacency matrix. 2.Find breadth first search traversal. 3. Show queue positions.	[1+1+1=3]	1	3
Q.2(a)	Justify each of the following are whether suitable applications for HMM model and why? a) Stock market price prediction b) Daily weather prediction in Kolkata c) Dress selection based of mood d) Medical diagnostic	[0.5x4=2]	4	4
Q.2(b)	Name models used for following applications and why? 1. User-to-User matching 2. Image transformation 3. POS tagging	[1+1+1=3]	4	4

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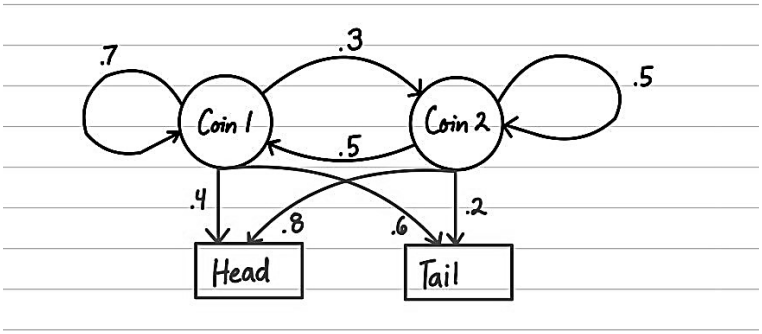
Q.3	Find the most probable hidden state sequence when we observed head, tail, tail, and head using the Viterbi Algorithm 1. Find initial probabilities. 2. Find transition and emission probability matrix. 3. Draw the Trellis Diagram. 4. Calculate probabilities. 5. Most probable hidden sequence.	[0.5+1+ 0.5+ 1.5+ 0.5]	2	3



Q.4(a)	Find the eigenvalues of given matrix: $\begin{bmatrix} 3 & 7 \\ 9 & 1 \end{bmatrix}$	[1+1]	1	3
Q.4(b)	Find the eigenvectors corresponding to eigen values obtained in 4(a)	[1.5+1.5]	1	3
Q.5(a)	Prove that MM^T and M^TM has same eigen values.	[1+1]	2	2
Q.5(b)	Find the covariance matrix for the following sample data.	[3]	2	3

X	Y	Z
15	12.5	50
35	15.8	55
20	9.3	70
14	20.1	65
28	5.2	80

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