Roll No.											

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025	
Date: 23-12-2025	**Time:** 09:30am – 12:30pm

School: SOCSE	**Program:** CAI, ISE	
Course Code: CSE2264	**Course Name:** Essentials of AI	
Semester: III	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**20**	**20**	**20**	**40**	

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	State the **Conjunctive** Normal Form of the statement P(x) -> Q(x).	**2 Marks**	**L1**	**CO1**
2.	State the data structure used in breadth-first search.	**2 Marks**	**L1**	**CO1**
3.	We are using N variables in the N Queen's Problem. State the domain of each variable	**2 Marks**	**L1**	**CO1**
4.	State the term that mentions the set of rules that are accepted in a logic.	**2 Marks**	**L1**	**CO1**
5.	State true or false. The sum of all probabilities in a probability model is 1.	**2 Marks**	**L1**	**CO1**
6.	State true or false. If 2 events with non-zero probabilities are mutually exclusive, they are also independent.	**2 Marks**	**L1**	**CO1**
7.	A generalized heuristic search function f(n) uses the equation f(n) = a*g(n) + b*h(n). State the values of a and b for the equation to represent the A* Search.	**2 Marks**	**L1**	**CO1**

8.	Name the data structure which is used to keep track of the nodes which are not yet visited in Uniform Cost Search.	**2 Marks**	**L1**	**CO1**
9.	State the algorithm paradigm for the Viterbi Algorithm	**2 Marks**	**L1**	**CO1**
10.	FOL uses 2 different quantifiers. State the 2 additional inference rules which arise due to FOL having the **Universal Quantifier**.	**2 Marks**	**L1**	**CO1**

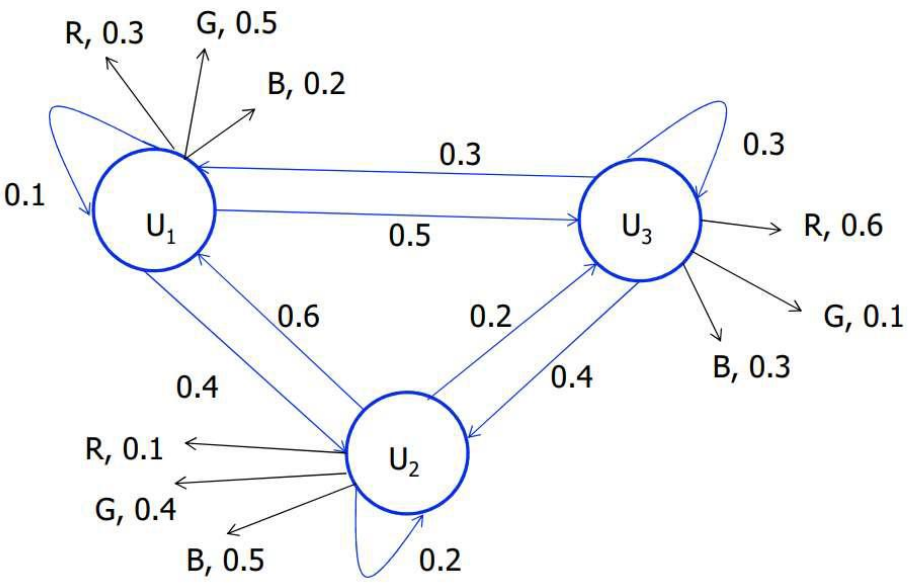
Part B

Answer the Questions. **Total Marks 80M**

11.	Calculate the probability of each of the scenarios for a fair dice: i) You roll 6,6,6 in 3 consecutive rolls. ii) You roll 6,6,6 in 3 rolls (need not be consecutive). iii) You select an Ace, put it back, and then select a Diamond. iv) You select the Ace of Diamonds, given that you select a letter card. v) You select the Ace of Diamonds, given that you select a face card.	**20 Marks**	**L3**	**CO4**
	Or			
12.	Calculate the probability of each of the scenarios for a deck of cards: i) You select the **Ace of Diamonds**. ii) You select **an Ace** OR **a Diamond**. iii) You select **an Ace**, put it back, and then select **a Diamond**. **iv)** You select the **Ace of Diamonds**, given that you select **a letter card**. **v)** You select the **Ace of Diamonds**, given that you select **a face card**.	**20 Marks**	**L3**	**CO4**

13.	Consider the **undirected** graph with the following edges: AC = 7, AD = 2, AE = 9, AF = 2, BE = 1, BC = 3, BD = 6, CD = 3, EF = 4, EG = 3, and FG = 1. Demonstrate Dijkstra's Single-Source Shortest Path Algorithm starting from **B** as the starting node.	**20 Marks**	**L3**	**CO3**
	Or			
14.	For the graph shown in the previous question, apply uniform cost search to find the shortest path from the node B to the nodes: a) A b) F c) G	**20 Marks**	**L3**	**CO3**

15.	Consider the following scenario: Wolves, foxes, birds, caterpillars, and snails are animals, and there are some of each of them. Also there are some grains, and grains are plants. Every animal either likes to eat all plants or all animals much smaller than itself that like to eat some plants. Caterpillars and snails are much smaller than birds, which are much smaller than foxes, which in turn are much smaller than wolves. Wolves do not like to eat foxes or grains, while birds like to eat caterpillars but not snails. Caterpillars and snails like to eat some plants. Classify the following terms as either a constant, a function, a variable, or a predicate. For functions and predicates, define them suitably (Eg. If we have a term called child which is a predicate, we define child(x) = "x is a child") **(a)** Animal **(b)** Bird **(c)** Caterpillar **(d)** Plant **(e)** Eats **(f)** Fox **(g)** Grain (h) Smaller (i) Wolf (j) Snail	**20 Marks**	**L2**	**CO2**
Or				
16.	Translate the following to Conjunctive Normal Form i) Everything is bitter or sweet ii) Either everything is bitter or everything is sweet iii) There is somebody who is loved by everyone **iv)** Nobody is loved by no one **v)** If someone is noisy, everybody is annoyed	**20 Marks**	**L2**	**CO2**

17.	Consider the following HMM represented as a state diagram.  Calculate the most probable state sequence to produce the observations **G B B R B**. Assume that each state has equal initial probability. You must mention the Viterbi probability and back-pointer at each and every step.	**20 Marks**	**L3**	**CO4**
Or				
18.	Consider the HMM given in **Question 17**. Calculate the most probable state sequence to produce the observations **R G B R B**. Assume that each state has equal initial probability. You must mention the Viterbi probability and back-pointer at each and every step.	**20 Marks**	**L3**	**CO4**