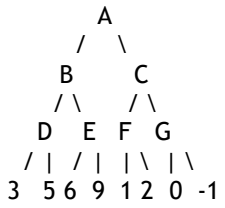
BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER : VII**
BRANCH: CSE **SESSION : SP/2024**

SUBJECT: AI307 ADVANCED ARTIFICIAL INTELLIGENCE MODERN ARTIFICIAL INTELLIGENCE
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)	You are designing a customer service chatbot for an online retail platform. The chatbot's goal is to answer customer inquiries accurately and efficiently and, where possible, make personalized product recommendations. i. Describe the environment in which the chatbot operates. Is it fully observable or partially observable? Episodic or sequential? Explain your reasoning. ii. Would a model-based reflex agent or a utility-based agent be more appropriate for this chatbot? Justify your choice. iii. What might limit the chatbot's rationality? Give an example of a scenario where the chatbot's response might not be rational due to environmental or design limitations.	[10]	CO1,3	BL1,4
Q.2(a)	You are tasked with programming a robot to navigate through a maze and find the shortest path to the exit. The robot can only move in four directions (up, down, left, right), and it cannot pass through walls. Define the state space for this problem. What does each state represent, and what are the possible transitions? Propose a heuristic that could be used if you were to implement an A* (A-star) search to make the robot more efficient. Justify why your heuristic is admissible.	[5]	CO1,3	BL2,4
Q.2(b)	Consider the following instance of Mini-Max game tree. Apply alpha-beta pruning to the tree to determine final value of the root node and optimal move. Indicate which branches (if any) can be pruned as you progress through the tree. Show the alpha and beta values at each node where a decision is made. 	[5]	CO2,3	BL3
Q.3(a)	The following statements describe relationships between animals: i. "All birds can fly." ii. "Penguins are birds, but they cannot fly." iii. "There exists an animal that can fly and is not a bird." iv. "If an animal is a penguin, then it is also a bird." Define the following predicates: i. Bird(x): x is a bird ii. Fly(x): x can fly iii. Penguin(x): x is a penguin iv. Animal(x): x is an animal. Translate each of the statements into FOL using the predicates above.	[5]	CO1,4	BL3

PTO

Q.3(b)	You are building a simple medical expert system to diagnose the flu. Rule1. If a person has a fever and a sore throat, they might have the flu. *Fever(x)∧SoreThroat(x)→PossibleFlu(x)* Rule2. If a person has a cough and fatigue, they might have a respiratory infection. *Cough(x)∧Fatigue(x)→PossibleRespiratoryInfection(x)* Rule3. If a person has a respiratory infection and is coughing, they should take medication. *PossibleRespiratoryInfection(x)∧Cough(x)→TakeMedication(x)* Rule4. If a person has a fever, they should rest. *Fever(x)→Rest(x)* Facts: Anna has a fever. Anna has a sore throat. Anna has fatigue. Use forward chaining to deduce whether Anna might have the flu or respiratory infection.	[5]	CO1,4	BL3
Q.4(a)	Describe Dempster-Shafer Theory with suitable example.	[5]	CO1,3	BL1,3
Q.4(b)	Using goal stack planning, achieve the goal state from the initial state Initial State: There are three blocks: A, B, and C. The blocks are currently in the following configuration: OnTable(A), On(B,A), OnTable(C), Clear(B), Clear(C) Goal State: Arrange the blocks so that: On(A,B), On(B,C), OnTable(C) Actions: i. Move(x, y): Move block x onto block y; Preconditions: Clear(x)∧Clear(y)∧OnTable(x); Effects: ¬Clear(y)∧On(x,y) ii. MoveToTable(x): Move block x to the table; Preconditions: Clear(x)∧∃y (On(x,y)); Effects: OnTable(x)∧¬On(x,y)	[5]	CO2,5	BL3
Q.5(a)	Contrast the InfoGain and Gain Ratio measures for Decision Tree construction using suitable example.	[5]	CO5	BL1,3
Q.5(b)	Briefly explain the steps of CNN training with suitable illustration.	[5]	CO5	BL1,3

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