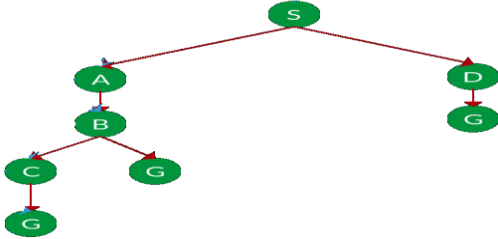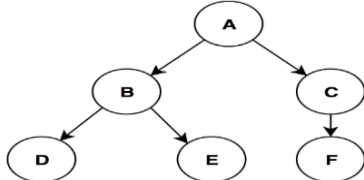| USN										Course Code		2	1	A	I	5	1

Fifth Semester B.E. Degree Examinations, September/October 2024
PRINCIPLES OF ARTIFICIAL INTELLIGENCE

Duration: 3 hrs   **Max. Marks: 100**

Note: *1. Answer any **FIVE** full questions choosing ONE full Question from each Module.*
        2. Missing data, if any, may be suitably assumed

Q. No		*Question*	*Marks*	*(RBTL:CO:PI)*
		Module-1		
1.	**a.**	Define Artificial Intelligence. Explain the techniques of A.I. Also describe the characteristics of Artificial Intelligence.	**10**	(2:1:1.3.1)
	b.	What is a rational agent with an example? What are the four characteristics of a rational agent? What are the four types of agents?	**10**	(2:1:1.3.1)
		(OR)		
2.	**a.**	Explain any two AI techniques for solving tic-tac-toe problem.	**10**	(2:1:1.3.1)
	b.	What are the properties of task environment?	**10**	(2:1:1.3.1)
		Module-2		
3.	**a.**	Write Breath First Search (BFS) algorithm and apply the technique for the graph shown in **Fig. Q3 (a)** and show its output.	**10**	(3:3:3.1.1)

Fig. Q3 (a)

	b.	Explain with examples the difference between informed and uninformed search algorithm.	**10**	(2:3:1.3.1)
		(OR)		
4.	**a.**	Write Depth First Search (DFS) algorithm and apply the technique for the graph shown in **Fig. Q4 (a)** and show its output path with start node as A and goal (end) node as E.	**10**	(2:3:3.1.1)

Fig. Q4 (a)

	b.	A Water Jug Problem: You are given two jugs, a 4-gallon one and a 3-gallon one, a pump which has unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. How can you get exactly 2 gallons of water in the 4-gallon jug? (i) Write down the production rules for the above problem and (ii) Write any one solution to the above problem.	**10**	(3:3:3.1.1)

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI– Performance Indicator)

Module-3

5. **a.** Write A* Algorithm and find the shortest path from initial node to final (goal) node for given graph in **Fig Q5(a).**   **10**   (3:3:3.1.1)
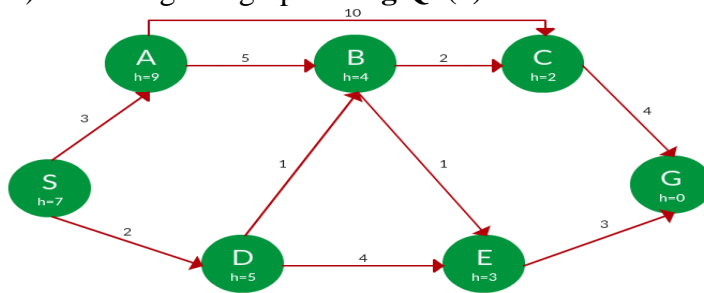

Fig Q5(a)

Hint: '**h**' in the node indicated heuristic value; **S** is the start node; **G** is the goal node; Label on link indicates cost.

b. List and explain different types of knowledge representation. Also state the issues.   **10**   (2:3:1.3.1)

(OR)

6. **a.** What is a Wumpus world, how does it relate to AI? Discuss the reasoning involved in making decisions within the Wumpus world.   **10**   (2:3:1.3.1)

b. Develop a step by step walk through of greedy best first search and A* search applied to a specific AI problem. Include the start state, goal state and the selected node at each step.   **10**   (2:3:1.3.1)

Module-4

7. **a.** Review the following set of well-formed formulas in predicate logic.   **10**   (3:4:3.1.1)
 (i) Man (Marcus)
 (ii) Pompeian (Marcus)
(iii) $\forall x$: Pompeian(x) $\rightarrow$ Roman(x)
(iv) ruler (Caesar)
(v) $\forall x$: Roman(x) $\rightarrow$ loyal to(X. Caesar) V hate(x, Caesar)
(vi) $\forall x : \exists y$: loyal to(x, y)
(vii) $\forall x : \forall y$: man(x) $\wedge$ ruler(y) $\wedge$ try assassinate (x, y) $\rightarrow$ loyal to(x, y)
(viii) try assassinate (Marcus, Caesar)
Convert these into clause form and prove that hate (marcus, Caesar) using resolution proof

b. Differentiate the following and give an example for each.   **10**   (2:4:1.3.1)
(i) Prepositional and predicate logic
(ii) Forward and backward reasoning.

(OR)

8. **a.** Explain the concept of existential instantiation and how it is used in predicate logic?   **10**   (2:4:1.3.1)

b. Apply resolution method using First Order Predicate Logic (FOPL) to prove that the goal is achieved for the given knowledge base and draw the resolution tree.   **10**   (3:4:1.3.1)
Knowledge Base:
        Gita likes all kinds of food.
        Mango and chapati are food.
        Gita eats almond and is still alive.
        Anything eaten by anyone and is still alive is food.
Goal: Gita likes almond.

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI– Performance Indicator)

Module-5

9.	**a.**	Illustrate Bayes Theorem and how does Bayesian reasoning contribute to managing uncertainty in decision making processes.	**10**	(3:5:3.1.1)
	b.	Discuss few real-world applications where reasoning under uncertainty is critical in AI.	**10**	(3:5:3.1.1)

(OR)

10	**a.**	Define Bayes Theorem and Apply for given scenario to diagnose that the patient is having cancer or not? Also state the practical difficulties in applying Bayesian method.	**10**	(3:5:3.1.1)

          Scenario: A new patient has undergone cancer test which resulted *positive* with the following assumptions as given below.
- (i) We have prior knowledge of the entire population .008 have cancer disease.
- (ii) Available data has two possible outcomes, positive and negative.
- (iii) 98 % of test results are correct positive.
- (iv) 97% of test results are correct negative.

In other cases, test results are in opposite.

	b.	Discuss the challenges associated with reasoning under uncertainty in AI systems.	**10**	(3:5:3.1.1)

** ** **

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI– Performance Indicator)