Shirpur Education Society's

R. C. PATEL INSTITUTE OF TECHNOLOGY, SHIRPUR
An Autonomous Institute
[Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere]

आर. सी. पटेल इन्स्टिट्यूट ऑफ टेक्नॉलॉजी, शिरपूर
(स्वायत्त महाविद्यालय)

A.Y. 2022-23-Year-III/Semester-V

Program: B.Tech (COMP SCI & ENGG-Data Science)
Course: Artificial Intelligence (PCCS5020T)
Date: 07/01/2023

Max Marks:75
Time: 10.30am-01.30 pm
Duration: 3 Hrs

END SEMESTER EXAMINATION ODD SEM- V – JAN- 2023

REGULAR EXAMINATION

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.

(1) This question paper contains 04 pages.
(2) All Questions are Compulsory.
(3) All questions carry equal marks.
(4) Answer to each new question is to be started on a fresh page.
(5) Figures in the brackets on the right indicate full marks.
(6) Assume suitable data wherever required, but justify it.
(7) Draw the neat labelled diagrams, wherever necessary.
(8) Mention correct question number in the answer sheet.

Question No.		Max. Marks
Q1 (a)	Write PEAS for the following problems 1) Refinery Control 2) Part Picking Robot 3) Tutoring system 4) Satellite Imaging System	[08]
Q1 (b)	Differentiate between following environment types 1) Static and Dynamic 2) Episodic and Sequential 3) Single agent and Multiple agent	[07]
Q2 (a)	1) Explain with reasons which search algorithm amongst DFS, BFS or DFID will be applied for the following problems: • A robot finding its way in a maze. • Finding a winning move in a chessboard. • Finding all winning moves in a chessboard. • A sensor trying to route a packet to another sensor. (assuming network topology is known) Justify your answers with a description of your search primitives and state definitions for each problem.	[08]
	OR	
Q2 (a)	2) Consider a SAT problem with 5 variables a,b,c,d,e.	[08]

$$F = (a \lor b) \land (\neg a \lor \neg d) \land (\neg b \lor \neg c) \land (\neg b \lor \neg d) \land (c \lor d) \land (\neg c \lor \neg e);$$

Let S="11111" be the start node, then Sa="01111", Sb="10111", Sc="11011", Sd="11101" and Se="11110" are the neighbours generated by the change-one-bit MoveGen function. Use the number of clauses satisfied as the heuristic function. Compute the heuristic values of S, Sa, Sb, ..., Se. Observe that this is a maximization problem.

    i.   Find the heuristic values of S, Sa, and Sb.
    ii.   Use **Beam Search** with w=2 to solve the above SAT problem. Candidate "11111" is the start node at level 1. Now, list the two nodes in level 2 that will be placed in the beam. When multiple nodes have the same cost then sort those nodes by node label (ascending) and select from the head of the sorted list. Find the node labels (5 bits each).
    iii.   What is the variable assignment that makes the given SAT formula true?

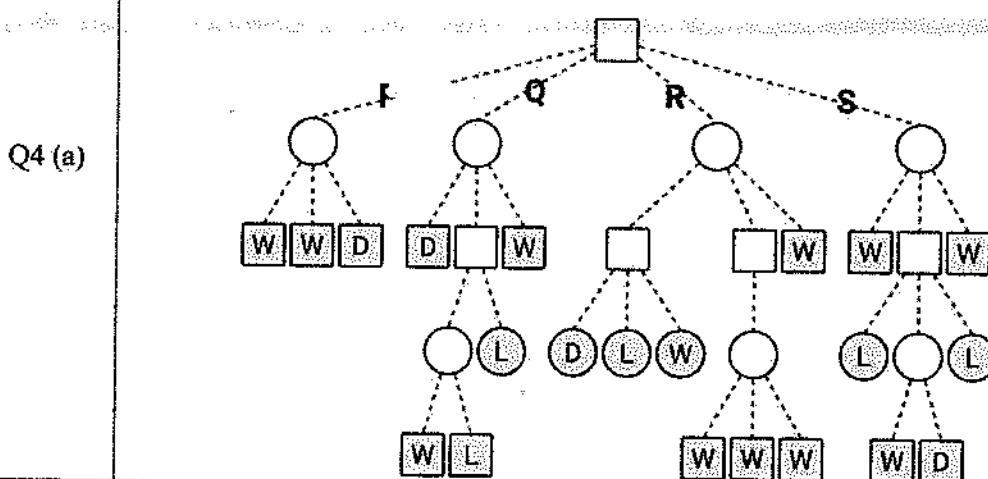|		
Q2 (b)	Answer the following 1) Write a pseudo code for **reconstruct path** for search algorithms. 2) Which estimate is suitable for heuristic function in A*? Underestimate or overestimate?	[03] [04]
Q3 (a)	Discuss the advantages and disadvantages of Hill Climbing Algorithm.	[05]
Q3 (b)	What do the terms "exploitation" and "exploration" refer to in the context of search?	[05]

Q3 (c)	Out of four algorithms which one has **best space complexity**, and which one is **optimal**?
	  i. DFID
	  ii. Best First Search
	  iii. Hill Climbing
	  iv. A*
		[05]

Q4 (a)	The figure shows a game tree with evaluations W (win), L (loss) and D (draw) from Max's perspective. In this game tree the labels P, Q, R, S indicate strategies/moves at the level of root. 	[05]

	i. What is the outcome (W, L or D) of the game when both players play perfectly? ii. Which is the winning move (P,Q,R or S)? Justify your answer.	

Q4 (b)	1) Following data is stored in Knowledge Base (KB = All cats like fish, cats eat everything they like and Ziggy is a cat.)
	    a. Convert this knowledge in First Order Logic.
	    b. Using Forward chaining find "Does Ziggy eat fish?"
	    c. Using Backward chaining Prove "Does Ziggy eat fish?
		[10]

	OR	
Q4 (b)	2) Device a plan using AO* algorithm for hosting a fresher's party in college for your juniors. The plan should include selection of venue (5-star hotel, 3-star hotel or college auditorium), Activities (D.J, College band, Local Music group), Food (package deal with venue and food, food boxes or separate caterer), While making the plans you can also explore the option of hotels tie ups with the activities and food. Assume suitable costs at each leaf node and apply AO* to find best plan. Draw And-OR graph and show all the steps.	[10]

Q5 (a)	Answer the following:
	  I. Consider the two fuzzy set
	    A = {(1,0.2), (2, 0.3), (3, 0.4), (4, 0.5)}
	    B= {(1,0.1), (2, 0.2), (3, 0.2), (4, 1)}
	    Find the algebraic sum, algebraic product, bounded sum and bounded difference of the given fuzzy sets.
	  II. Explain alpha-beta pruning.
	  III. What are the three main components of an Expert System?
		[06]
		
		[04]
		[05]

	OR	

Q5 (b)	Design a fuzzy controller to regulate the temperature of a domestic shower
	Assume that
	   • Temperature is adjusted with single mixer tap
	   • Flow of water is constant
	   • Control variable is the ratio of hot water to cold water input.
	Design should clearly mention the descriptors used and the control variable, set of rules to generate control action and defuzzification.
		[15]

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