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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science and Engineering

Final Semester Examination, Summer-2025

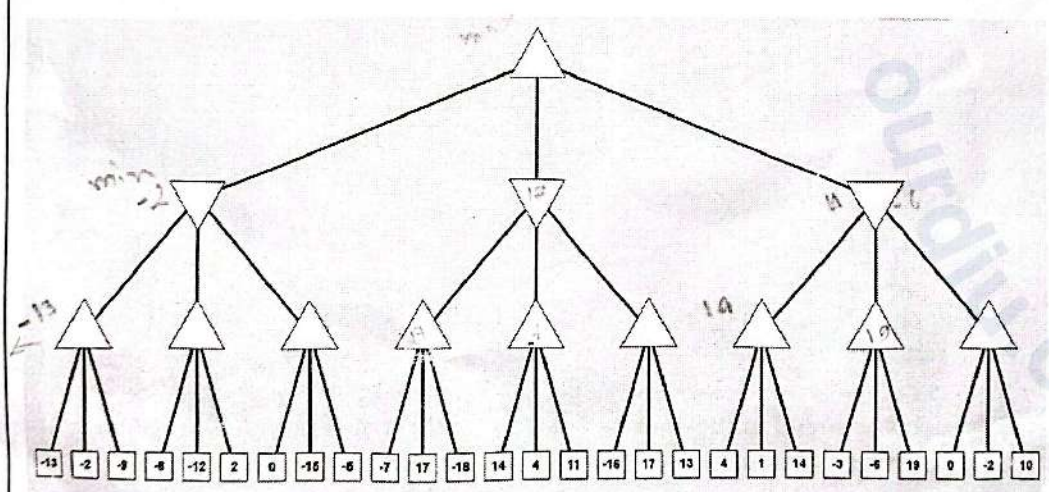
Course Code: CSE411 Course Title: Artificial Intelligence

Level : 4 Term: 1 Batch: 63

Exam Duration: 2 Hours **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	***a)***	A small weather station uses a logical agent to decide whether to turn on the air conditioner. Consider the following scenario as a KB. Now, **Construct** the following scenario into propositional logic, then use a full truth table to show whether the conclusion follows from the KB satisfiable or unsatisfiable- i) Today it is cloudy. ii) Today humidity is low. iii) If it is cloudy or humid, then the weather is uncomfortable. iv) If the weather is uncomfortable, then the air conditioner is on.	**[6]**	**[CO3]**
	b)	Assume that, $KB = (p \rightarrow q) \wedge r, r \leftrightarrow s, p \vee s$ and $\alpha = (q \wedge \neg r) \rightarrow s$. Find whether KB $\models \alpha$.	**[4]**	
2.	***a)***	Imagine two of your friends, Amin(alpha) and Samin(beta) are playing a tic-tac-toe game. You want Samin to win the game. Figure 1 is the tree of their game. Now, **Develop** solution on your known memory efficient gaming algorithm to find the result state.  **Figure: 1**	**[4]**	**[CO3]**
	b)	Consider the Question 2a and now you want Amin to win the game. Will the game tree and final state be same now? **Illustrate** your answer for the alternate gaming algorithm mentioned in question 2a. Compare the performance measures of the two algorithms.	**[4]**	
	c)	**Explain** the elements of search problem representing a game.	**[2]**	

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3.	Scenario 1: A new grammar is proposed with the following rules: S→aSBC|aBC CB→BC aB→ab bB→bb bC→bc cC→cc Scenario 2: After that another Context Free Grammar is proposed S→AB A→aA|ε B→bB|ε			**[CO2]**
	a)	**Classify** this grammar within the Chomsky hierarchy (Type-0 to Type-3) and justify your answer.	**[3]**	
	b)	From Scenario 2: Convert the grammar to CNF, now **Discuss** that the derived language remains unchanged	**[2]**	
4.	***a)***	In a manufacturing company, four distinct machines denoted as M_1, M_2, M_3, and M_4 are responsible for producing widgets. M_1 produces 10% of the total widgets, M_2 produces 20%, M_3 produces 30%, and M_4 produces 40%. The defective rates for the respective machines are 4%, 6%, 2% and 5%. If a randomly selected widget is found not to be defective, **Identify** the probability that it was produced by M_3.	**[3]**	**[CO2]**
	b)	**Explain** the different reasons for uncertainty encountered in Artificial Intelligence systems and discuss how these uncertainties affect AI decision-making processes.	**[2]**	
5.	Read the scenario carefully and answer the associate question: Daffodil International University (DIU) has implemented a Smart Authentication System to control access and track attendance across multiple zones, such as classrooms, labs, and the library. The system uses a combination of biometric scans, RFID cards, and face recognition technology. The goal is to automate attendance logging and ensure only authorized individuals can access restricted areas. The system uses a perceptron-based decision model to compute a confidence score based on three key inputs: x_1: Biometric match score (0 to 1), x_2: RFID card validity (1,0) , x_3: Face recognition score (0 to 1). Each input has an associated weight: $(W1, W2, W3) = (0.5, 0.3, 0.2)$. The system grants access and logs attendance if the weighted sum of the scores is greater than or equal to a threshold $(\theta) = 0.7$. Otherwise, the system denies access and marks the attempt for manual review.			**[CO4]**
	a)	A student attempts to enter the Laboratory with the following inputs: • Biometric match = 0.8 • RFID validity = 1 • Face recognition score = 0.6 Now, **Examine** the weighted sum and determine if the student is granted access to the laboratory. Show all steps clearly.	**[5]**	
	b)	**Analyze** how the system demonstrates the concepts of perception and computation in the decision-making process for accessing different zones at DIU. Also, mention one advantage and one challenge of using this automated system in the library and classrooms at DIU.	**[5]**	