



Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Final Examination, Fall 2025

Course Code: CSE 316, Course Title: Artificial Intelligence

Level:03 Term:02 Batch: 64

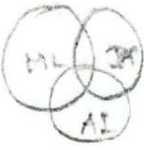
Time: 02:00 Hrs

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)	Explain briefly how to generate a game-playing search algorithm by using the basic elements of a game. Let's Consider 1(b) Game Tree and Explain the Minimax algorithm and how it determines the optimal move for the MAX player.	05	CO3
	b)	Apply the alpha -Beta Pruning Algorithm in following Graph.	05	
2.	a)	A fruit-processing factory uses an automated apple-sorting machine to separate apples into “Fresh” and “Defective” categories. The factory wants to ensure only fresh apples are packed for sale, so the sorting machine uses a high-resolution camera and image-processing software to detect defects. Based on historical data about 10% of all apples are defective, meaning they are bruised, rotten, or otherwise unsuitable for sale. The sorting machine is fairly accurate and correctly identifies a defective apple 85% of the time. However, sometimes the machine makes mistakes. It wrongly flags a fresh apple as defective 5% of the time. The factory manager wants to know: how reliable is this detection? Determine the probability that the apple is truly defective given that the machine flagged it? Please use as P(D) for defective and P(F) for fresh.	05	CO2
	b)	At a tech university, students are enrolled in four programs: AI (40), ML (35), Cybersecurity (25), and IoT (20). Some students take multiple programs: 10 students are enrolled in both AI and ML, and 3 students are enrolled in both AI and IoT. The total number of students is 120.	05	

		I. Determine the probability that a randomly selected student is enrolled in AI or ML? II. Calculate the probability that a student is enrolled in ML or IoT, but not AI?	0.542 0.076	
3.	a)	Consider the following Knowledge Base (KB): $(A \rightarrow B) \wedge (B \vee C) \wedge (\neg C \vee A)$ And $\alpha = (A \wedge \neg C)$, Determine whether: $KB \models \alpha$.	05	CO2
	b)	Explain the components of a formal CFG and convert to the CNF of given CFG. $S \rightarrow NP VP$ $NP \rightarrow Det N \mid N$ $VP \rightarrow V NP$ $Det \rightarrow the \mid a$ $N \rightarrow dog \mid cat$ $V \rightarrow sees$ 	05	
4.	a)	The DIU IoT Lab has deployed a "Smart Farming" system in a greenhouse to automate irrigation. This system uses a Perceptron-based decision model, utilizing environmental data, to determine when to activate the water sprinklers. The system accepts three normalized inputs from sensors: 1. x_1: Soil Dryness Level (0 to 1, where 1 is completely dry). 2. x_2: Temperature (0 to 1, normalized based on max daily heat). 3. x_3: Rain Forecast Probability (0 to 1, where 1 is 100% chance of rain). The AI engineer has assigned the following associated weights to these inputs to prioritize soil conditions over the forecast: $W = (W_1, W_2, W_3) = (0.6, 0.3, -0.4)$ (Note: The rain forecast has a negative weight because high rain probability should discourage watering.) The system activates the sprinklers (Output = 1) if the weighted sum is greater than or equal to a threshold value (θ) = 0.5. Otherwise, the sprinklers remain off (Output = 0). At 2:00 PM, the sensors record the following data: • Soil Dryness = 0.7 • Temperature = 0.8 • Rain Forecast = 0.2 Examine the weighted sum using the perceptron formula and determine if the Smart Farming system will turn on the sprinklers. Show your steps clearly.	05	CO4
	b)	Analyze the limitation of using a Single Layer Perceptron (SLP) for this specific decision-making process. Specifically, explain what would happen if the relationship between the inputs required a non-linear decision boundary (e.g., the "XOR problem") and suggest which AI architecture should replace the SLP to solve that issue.	05	