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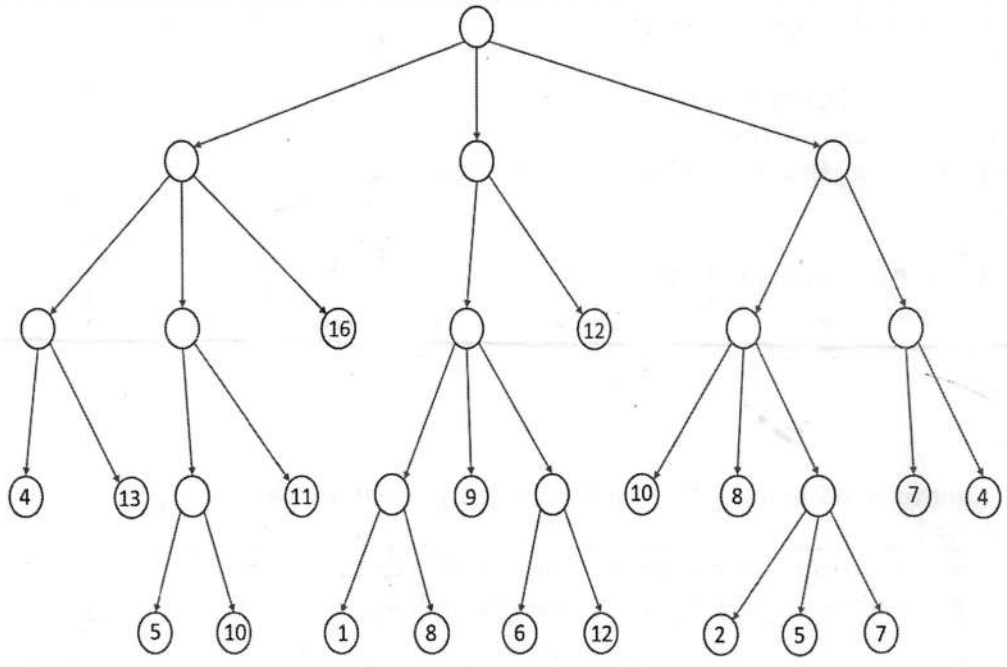
Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science & Engineering
Final Examination, Fall 2025
Course Code: 411, Course Title: Artificial Intelligence
Level:4 Term:1 Batch: 62

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)***	Simulate your known memory efficient gaming algorithm to find the result state for the following game tree of a tic-tac-toe game.  **Figure: 1**	**[4]**	**CO2**
	b)	Consider the game tree of question 1(a). Will the game tree and final state be same if we change the algorithm? **Justify** your answer by executing the alternate gaming algorithm that you mentioned in question 1a. Compare the performance measures of the two algorithms.	**[4]**	
	c)	**Explain** how to design good static board evaluator functions?	**[2]**	
2.	***a)***	The full joint distribution on the following table describes the probabilities of the combinations of vehicle types and vehicle owners. **Applying** these probabilities analyze the following questions.	**[5]**	**CO3**

Usage	Intensity	Fails
Low	0.02	0.28
Medium	0.08	0.32
High	0.15	0.15

i) Find the probability that a device is used at High intensity.
ii) Compute P(Fail|Usage = High).
iii) Determine P(Usage = Low ∨ Device = Fail).

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		iv) Check whether "Device Status" and "Usage Intensity" are independent. v) Calculate the probability that a device Works given that usage is not Low.		
	b)	At a carnival there is a prize wheel with three colored sectors: Red, Blue and Green. The carnival operator reports the following probabilities for a single spin: P(Red)=0.45, P(Blue)=0.30, P(Green)=0.20. i) **Demonstrate** Uncertainty, is this a valid probability model under Kolmogorov's axioms? ii) If not valid, **explain** which axiom(s) fail; if valid, compute P(not Green).	**[5]**	
3.		Suppose, Abdullah is planning a weekend trip. He has three conditions for deciding whether she will go on the trip. 1. If the weather is good, then she will go hiking or visit the lake. 2. If she does not go hiking, she will visit her grandmother. 3. She will go on the trip only if she visits the lake.	**[5]**	**CO2**
	a)	Now, Convert all the above statements into propositional logic formulas and also **Construct** a truth table for the combined knowledge base.	**[5]**	
	b)	Does the knowledge base entail the statement: $\alpha=(T \wedge W) \rightarrow L$. Use the truth table to **determine** whether **KB** $\models \alpha$.		
4.	***a)***	A robotics company is designing a custom command language to control a fleet of robots in a warehouse. The robots can move forward, backward, turn left or right, and perform pick-and-place operations. The grammar for the command language is defined as follows: Commands → Command Commands | ε Command → Move | Turn | Action Move → Forward Move | Backward Move | Forward | Backward Forward → f Backward → b Turn → Left Turn | Right Turn | Left | Right Left → l Right → r Action → Pick | Place Pick → p Place → q Convert the grammar into Chomsky Normal Form (CNF). **Examine** the language remains unchanged.	**[5]**	**CO4**
	b)	**Analyze** the robotic command language from Question 4(a) to multilayer perceptron design on advanced architecture for input encoding.	**[5]**	

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