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Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Mid Examination, Fall 2026

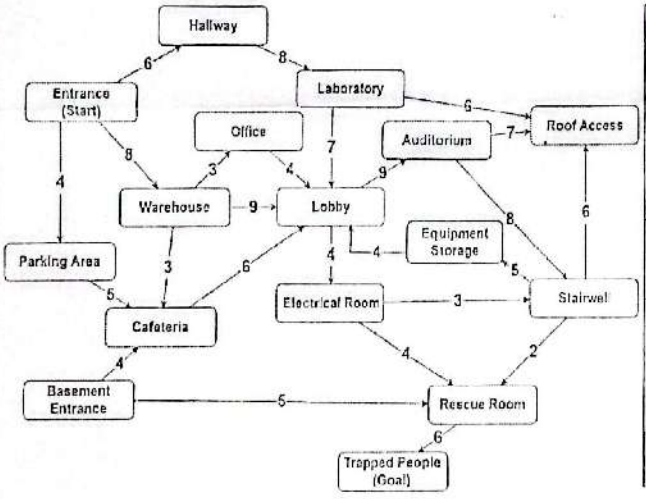
Course Code: SE333; Course Title: Artificial Intelligence

Sections & Teachers: CP (A, B), JA (C, D, E), SSR (F, G), TBH (H), ZNM (I), FMD(J)

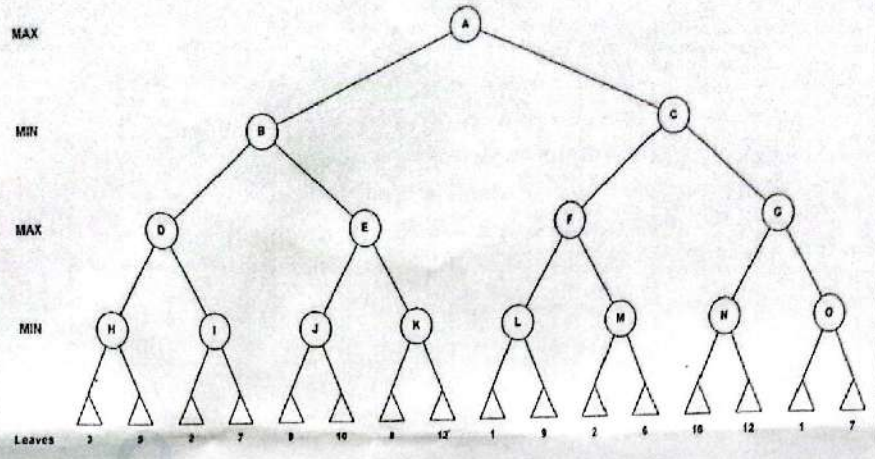
Time: 1:30 Hrs **Marks: 25**

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)	Asha is an autonomous rescue robot sent into a damaged building to locate trapped people. Its camera cannot see clearly through smoke, so it relies on thermal sensors, partial camera images, and previously observed information about corridors. The robot maintains an internal map and remembers which corridors it has already explored. However, doors may collapse, smoke may spread, and the building conditions may change while it moves. Asha must choose its movements carefully to avoid dangerous areas and locate trapped people. Based on the given scenario, **classify** the most appropriate agent type and the natures of its task environment, providing justification for your answers. **Visualize** the agent's working procedure using a suitable workflow diagram, showing how its internal representation supports decision-making.	[Marks : 4]	CLO 1 *Level 2*
	b)	 **h(n) values** Node | h(n) Entrance (Start) | 40 Hallway | 36 Laboratory | 30 Roof Access | 12 Office | 32 Auditorium | 18 Warehouse | 28 Lobby | 22 Equipment Storage | 26 Stairwell | 10 Parking Area | 25 Electrical Room | 18 Cafeteria | 20 Basement Entrance | 16 Rescue Room | 5 Trapped People (Goal) | 0 Based on the scenario described in **Question 1(a)**, Asha, an autonomous rescue robot, must navigate through a damaged building to locate trapped people using the minimum travel distance. Using the given graph, which represents different locations within the damaged building and their associated heuristic values h(n), **visualize** the **A* Search Algorithm** to determine the optimal path from the building entrance to the victim location. **Detail** the necessary calculations and **compute** the minimum travel cost along the selected path.	[Marks : 8]	
	c)	Does overestimation or underestimation of heuristic values affect the optimality of the A* Search Algorithm? **Defend** your answer with a brief example.	[Marks : 3]	

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2.	a)	 Consider a depth-4 game tree for a two-player zero-sum game, with MAX at the root and alternating MAX and MIN levels. Assuming both players play optimally, **simulate** the Alpha-Beta Pruning algorithm using a left-to-right traversal. **Trace** the updates of α and β at each internal node, **detect** all pruned branches and **calculate** the percentage of branches pruned.	[Marks :5]	CLO 2 *Level 3*
	b)	"Alpha–Beta Pruning is computationally more efficient than the Minimax algorithm when determining the optimal move in a game" **Validate** this statement by comparing their performance on the game tree illustrated in **Question 2(a).**	[Marks :2]	
3.		Based on the scenario described in **Question 1(a),** Asha, an autonomous rescue robot, monitors corridor conditions while navigating a damaged building. Each corridor is classified into one of four states: Safe (S), Smoke-Affected (M), Partially Blocked (P), or Blocked (B). Assume that the condition in the next time interval depends only on the current condition. **Initial State Probabilities** **Safe (S)** 0.4 | **Smoke-Affected (M)** 0.3 | **Partially Blocked (P)** 0.2 | **Blocked (B)** 0.1 **Transition Probability Matrix** **Current State / Next State** | **Safe (S)** | **Smoke-Affected (M)** | **Partially Blocked (P)** | **Blocked (B)** **Safe (S)** | 0.60 | 0.20 | 0.15 | 0.05 **Smoke-Affected (M)** | 0.20 | 0.50 | 0.20 | 0.10 **Partially Blocked (P)** | 0.10 | 0.20 | 0.50 | 0.20 **Blocked (B)** | 0.05 | 0.10 | 0.25 | 0.60 Using the given initial state probabilities and transition probability matrix, **calculate** the probability of the following sequence of corridor conditions: **Safe → Smoke-Affected → Partially Blocked → Blocked → Smoke-Affected → Safe.**	[Marks :3]	CLO 2 *Level 3*