

 SIES Graduate School of Technology RISE WITH EDUCATION NMACA+ (Affiliated to University of Mumbai)		End Semester Examination (R-24) FH 2026 Answer Key with marking scheme	
Branch: EXTC-IT-CSCIOT		Course: MDM I: Artificial Intelligence	
Year/ Semester: SE/IV		Course code: MDMC4011	
Time: 03 hours		Marks: 80	
			Marks
Q. 1	Attempt any FOUR. (All questions carry equal marks)		
A.	• Definition: System that perceives environment and takes intelligent actions → 2 marks • Key features: autonomy, adaptability → 1 mark • Examples: robot, chatbot → 2 marks		
B.	• Reflex agent: acts only on current percept, no memory → 2 marks • Model-based agent: uses internal state/history → 2 marks • Difference (table point): memory/decision capability → 1 mark		
C.	• Definition: Function that estimates cost to reach goal → 2 marks • Property: guides search efficiently → 1 mark • Example: straight-line distance → 2 marks		
D.	• Definition: Agent using knowledge base for reasoning → 2 marks • Components: KB + inference engine → 2 marks • Working: updates KB and infers actions → 1 mark		
E.	• Identification: Yes, conditional planning → 2 marks • Reason: depends on condition (door locked/unlocked) → 2 marks • Plan: if locked → use key else enter → 1 mark		
F.	• Definition: AI in retail operations → 1 mark • Recommendation systems → 1 mark • Inventory management → 1 mark • Demand forecasting → 1 mark • Example (Amazon etc.) → 1 mark		
Q.2	Attempt any FOUR. (All questions carry equal marks)		
A.	• Definition: Structure enabling intelligent decision-making → 2 marks Components: • Knowledge Base → stores facts → 2 marks • Inference Engine → applies logic → 2 marks • Learning Module → improves performance → 2 marks • User Interface → interaction → 1 mark Diagram → 2 marks Explanation of flow → 1 mark		
B.	• Definition: AI system for automated customer interaction → 2 marks Components: • NLP module → 1 mark • Knowledge base → 1 mark • Dialogue manager → 1 mark Classification: • Intelligent system → learning system → 3 marks Agent Type:		

	- Learning agent → 2 marks Justification: - Improves responses from user interaction → 1 mark																					
C.	Definition: Depth-first traversal → 2 marks Algorithm Steps: - Start at initial node A → 1 mark - Expand deepest node first → 2 marks - Use stack/backtracking → 2 marks - Continue until goal F → 2 marks Path Result: - First found path to F → 1 mark Assumptions: Start = A, Goal = F, order = left → right Step Stack (Top → Right) Node Popped Nodes Pushed Expansion Order <table><tr><td>1</td><td>[A]</td><td>A</td><td>E, D, B</td><td>A</td></tr><tr><td>2</td><td>[E, D, B]</td><td>B</td><td>E, C</td><td>A, B</td></tr><tr><td>3</td><td>[E, D, E, C]</td><td>C</td><td>F</td><td>A, B, C</td></tr><tr><td>4</td><td>[E, D, E, F]</td><td>F</td><td>—</td><td>A, B, C, F</td></tr></table>	1	[A]	A	E, D, B	A	2	[E, D, B]	B	E, C	A, B	3	[E, D, E, C]	C	F	A, B, C	4	[E, D, E, F]	F	—	A, B, C, F	
1	[A]	A	E, D, B	A																		
2	[E, D, B]	B	E, C	A, B																		
3	[E, D, E, C]	C	F	A, B, C																		
4	[E, D, E, F]	F	—	A, B, C, F																		
D.	Step 1: Convert to FOL / clauses → 3 marks - Maid → $\neg$Butler - Maid $\vee$ Milk - Milk → Cream Step 2: Convert to CNF → 2 marks Step 3: Negate goal → 1 mark Step 4: Apply resolution → 3 marks - Derive Cream - Resolve contradiction Conclusion valid → 1 mark																					
E.	Solution using ADL: - Init($\text{At(Flat,Axle)} \wedge \text{At(Spare,Trunk)}$) - Goal($\text{At(Spare,Axle)}$) - Action(remove(Spare,Trunk), - PRECOND: At(Spare,Trunk) - EFFECT : $\neg \text{At(Spare,trunk)} \wedge \text{At(Spare, Ground)}$ - Action(Remove(Flat,Axle), - PRECOND: At(Flat,Axle) - EFFECT : $\neg \text{At(Flat,Axle)} \wedge \text{At(Flat, Ground)}$ - Action(PutOn(Spare,Axle), - PRECOND ; $\text{At(Spare,Ground)} \wedge \neg \text{At(Flat,Axle)}$ - EFFECT: $\neg \text{At(Spare,Ground)} \wedge \text{At(Spare,Axle)}$ - Action(LeaveOvernight) - PRECOND - EFFECT : $\neg \text{At(Spare,Ground)} \wedge \neg \text{At(Spare, Axle)} \wedge \neg \text{At(Spare,trunk)} \wedge \neg \text{At(Flat,Ground)} \wedge \neg \text{At(Flat,Axle)}$ Predicates:																					

	- At(Spare, Trunk), At(Flat, Axle) → 2 marks Initial State: - Spare in trunk - Flat on axle → 2 marks Goal State: - Spare on axle - Flat on ground → 2 marks Actions: - Remove spare → 1 mark - Remove flat → 1 mark - Put spare → 1 mark - Leave car → 1 mark Plan: - Remove spare → Remove flat → Put spare → 2 marks	
F.	Definition: Rules defining sentence structure → 2 marks Types: - Regular grammar → 2 marks - Context-free grammar → 2 marks - Context-sensitive grammar → 2 marks Role: - Helps parsing and syntax analysis → 1 mark Example → 1 mark	
Q.3	Attempt any FOUR. (All questions carry equal marks)	
A.	- Not all students like both math and science: $\neg \forall x (\text{Student}(x) \rightarrow \text{Likes}(x, \text{Math} \wedge \text{Science}))$ → 2 marks - Every man respects parents: $\forall x (\text{Man}(x) \rightarrow \text{Respects}(x, \text{Parents}(x)))$ → 3 marks	
B.	Definition: Environment characteristics → 1 mark - Observable → 1 mark - Deterministic → 1 mark - Episodic → 1 mark - Example → 1 mark	
C.	- Forward: data-driven → 2 marks - Backward: goal-driven → 2 marks - Difference → 1 mark	
D.	Definition: uses $h(n)$ → 2 marks - Working: select lowest heuristic → 2 marks - Application → 1 mark	
E.	Definition: DFS with depth limit → 2 marks - Advantage: avoids infinite depth → 2 marks - Limitation: cutoff → 1 mark	
F.	Definition: sliding tile problem → 1 mark - State space → 2 marks - Operators (move tiles) → 2 marks	