

CBCS SCHEME

USN

BAD402

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025

Artificial Intelligence

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1				M	L	C	
Q.1	a.	Explain the significance of the Turing Test in AI. What abilities does a computer need to pass the turing test? Discuss why AI researchers have not focused extensively on passing the Turing test.		10	L2	CO1	
	b.	Write the percept sequence for vacuum cleaner agent and tabulate the workflow of the same with respect to the scenario with location of square A and B as given in Fig.Q1(b).		10	L3	CO1	
OR							
Q.2	a.	Compare simple reflex agents and model-based reflex agents, focusing on their perception processing, decision-making methods and explain how model-based agents address the limitations of simple reflex agents with their schematic diagrams.		10	L3	CO1	
	b.	Analyze and discuss PEAS descriptor for the following applications in detail: i) Medical diagnosis s/m ii) Taxi driver iii) Interactive English tutor iv) Part picking robot v) Refinery controller.		10	L3	CO1	
Module – 2							
Q.3	a.	Define Toy problems and Real-world problems in the context of problem-solving approaches with an example for each type in detail.		10	L2	CO2	
	b.	Compare and contrast the vacuum world problem and the 8-tile puzzle problems discussing their state representations, initial states, actions and goal tests.		10	L3	CO2	
OR							
Q.4	a.	Explain the components and architecture of a problem solving agent.		10	L2	CO2	
	b.	Compare and contrast depth-first search with breadth-first search with examples.		10	L3	CO2	
Module – 3							
Q.5	a.	Outline a generic knowledge-based agent's program and discuss the difference between declarative and procedural approaches in the context of building knowledge-based agents.		10	L3	CO3	

	b.	Apply A* search algorithm to find the solution path from the start node (S) to the goal node (G). The heuristic values (h) are provided with the nodes, and the travel costs (C) are provided with the edges as shown in Fig.Q5(b).	10	L3	CO3
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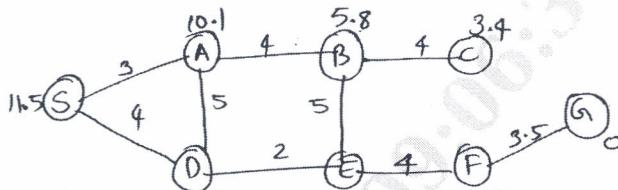


Fig.Q5(b)

OR

Q.6	a.	Describe the Wumpus world environment and the PEAS specification for the knowledge based agent. Explain how does the agent navigate and make decisions based on percepts in this environment.	10	L2	CO3
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	b.	Solve the following eight-tile puzzle using heuristic function approach and the tree diagram considering the initial and final states as specified.	10	L2	CO3
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1	2	3
4	5	
7	8	6
Initial State		

1	2	3
4	5	6
7	8	
Final State		

Module – 4

Q.7	a.	Define universal and existential instantiations with examples. Prove the following using Backward and forward chaining : “As per the law, it is a crime for an American to sell weapons to hostile nations. Country E, an enemy of America, has some missiles and all the missiles were sold to it by Solan, who is an American citizen”. Prove that “Solan is a criminal”.	10	L2	CO4
	b.	Explain the following with respect to first-order logic: (i) Assertions and queries (ii) Numbers, sets and lists (iii) The wumpus world.	10	L2	CO4

OR

Q.8	a.	Apply predicate logic to translate and formalize the following statements: (first order logic) (i) Marcus was a man. (ii) Marcus was a Pompeian. (iii) All Pompeian were Romans. (iv) Caesar was a ruler. (v) All Romans were either loyal to Caesar or hated him. (vi) Everyone is loyal to someone. (vii) People only try to assassinate rulers they are not loyal to. (viii) Marcus tried to assassinate Caesar (ix) All men are people. (x) Some people are loyal to Marcus. In each case, provide the appropriate predicates, quantifiers, variables and logical connectives to represent the statements accurately in predicate logic notations.	10	L3	CO4
	b.	Explain backward chaining algorithm with an example.	10	L2	CO4

Module – 5

Q.9	a.	In a city, 30% of the population owns a dog, while 70% owns a cat. Among dog owners, 80% take their dogs for daily walks and among cat owners, only 50% do so. If a person is observed walking their pet daily, calculate probability that this person owns a dog. State the Baye's theorem.	10	L3	CO5																			
	b.	Explain Expert Systems, detailing the characteristics, capabilities, incapabilities, components and provide two examples.	10	L2	CO5																			
OR																								
Q.10	a.	Explain uncertain knowledge in the context of artificial intelligence. Discuss the challenges an agent focus when acting under uncertainty with the example of diagnosing a dental patient's toothache.	10	L2	CO5																			
	b.	<p>Explain the concept of inference using full joint probability in the context of agents acting under uncertainty with an example of the following variables:</p> <p>Weather = {sunny, rain, cloudy, snow}, Cavity = {cavity, \negcavity}.</p> <p>Also calculate the following :</p> <p>$P(\text{cavity} \vee \text{toothache})$, $P(\text{cavity} \text{toothache})$, $P(\neg\text{cavity} \text{toothache})$,</p> <p>Given the following full joint distribution for the Toothache, Cavity, Catch world.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th colspan="2">Toothache</th> <th colspan="2">\negToothache</th> </tr> <tr> <th></th> <th>Catch</th> <th>\negCatch</th> <th>Catch</th> <th>\negCatch</th> </tr> </thead> <tbody> <tr> <td>Cavity</td> <td>0.108</td> <td>0.012</td> <td>0.072</td> <td>0.008</td> </tr> <tr> <td>\negCavity</td> <td>0.016</td> <td>0.064</td> <td>0.144</td> <td>0.576</td> </tr> </tbody> </table>		Toothache		\neg Toothache			Catch	\neg Catch	Catch	\neg Catch	Cavity	0.108	0.012	0.072	0.008	\neg Cavity	0.016	0.064	0.144	0.576	10	L3
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CBCS SCHEME

USN

BAD402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024

Artificial Intelligence

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C														
Q.1	a.	Define Artificial Intelligence. Explain the foundation of AI in detail.	10	L1	CO1														
	b.	Explain all four different approaches to AI in detail.	10	L1	CO1														
OR																			
Q.2	a.	Give PEAS specification for : i) Automated taxi driver ii) Medical diagnostic system.		10	L1	CO1													
	b.	Differentiation : i) Fully observable Vs partially observation ii) Single agent Vs Multiagent iii) Deterministic Vs stochastic iv) Static Vs Dynamic.		10	L1	CO1													
Module – 2																			
Q.3	a.	Explain five components and well defined problem. Consider an 8-puzzle problem as an example and explain.	10	L2	CO2														
	b.	Discuss in detail in Infrastructure for search algorithm.	10	L2	CO2														
OR																			
Q.4	a.	Write an algorithm for Breadth – first search and explain with an example.	10	L2	CO2														
	b.	Explain Depth first search techniques in detail.	10	L2	CO2														
Module – 3																			
Q.5	a.	Explain the A* search to minimize the total estimated cost.	10	L3	CO3														
	b.	Write an algorithm for hill climbing search and explain in detail.	10	L3	CO3														
OR																			
Q.6	a.	In the below graph, find the path from A to G. Using Greedy Best First search and A* search algorithm. The values in the table represent heuristic values of reaching the goal node G pass current node.	10	L3	CO3														
<p style="text-align: center;">Fig Q6(a)</p>			<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>A</td><td>5</td></tr> <tr><td>B</td><td>6</td></tr> <tr><td>C</td><td>4</td></tr> <tr><td>D</td><td>3</td></tr> <tr><td>E</td><td>3</td></tr> <tr><td>F</td><td>1</td></tr> <tr><td>G</td><td>0</td></tr> </table>			A	5	B	6	C	4	D	3	E	3	F	1	G	0
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B	6																		
C	4																		
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F	1																		
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	b.	Explain the syntax and semantics of propositional logic.	10	L3	CO3
Module – 4					
Q.7	a.	Explain the syntax and semantics of the first order logic.	10	L2	CO2
	b.	Explain the following with respect to the first order logic i) Assertions and Queries in first order logic ii) The Kinship domain iii) Numbers, sets and lists.	10	L2	CO2
OR					
Q.8	a.	Explain unification and lifting in detail.	10	L3	CO4
	b.	Explain Forward chaining algorithm with an example.	10	L3	CO4
Module – 5					
Q.9	a.	Explain basic probability Notation in detail.	10	L3	CO5
	b.	Explain Baye's rule and its use in detail.	10	L3	CO5
OR					
Q.10	a.	Explain Independence in Quantifying uncertainty with example.	10	L3	CO5
	b.	Explain knowledge Acquiring in detail.	10	L3	CO5

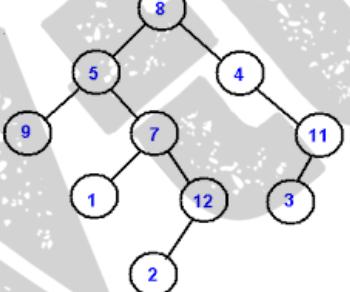
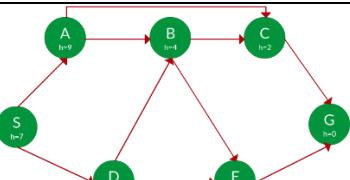
Model Question Paper with effect for 2022 (CBCS Scheme)

USN

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Fourth Semester B.E. Degree Examination
ARTIFICIAL INTELLIGENCE

TIME: 03 Hours**Max. Marks: 100**Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

Module -1				*Bloom's Taxonomy Level	Marks
Q.01	a	Define Total Turing test, logical positivism, tractable problems, decision theory, neurons			
	b	Explain the significant contributions of various branches in the foundations of AI		L2	10
	c	Give PEAS specification of biometric authentication system		L3	5
OR					
Q.02	a	Explain Milestones of AI with reference to (i) Neural networks failure to generalize (ii) Advent of DENDRAL (iii) Emergence of Intelligent Agents		L2	8
	b	Differentiate: (i)semi-dynamic vs dynamic (ii) episodic vs sequential (iii) deterministic vs stochastic		L2	7
	c	Give PEAS specification of Tomato classification system		L3	5
Module-2					
Q. 03	a	Define five components of a problem. Write a complete state space for a vacuum cleaner to clean 2 squares P and Q. Q is to the right of P		L3	10
	b	Illustrate the separation property of GRAPH-SEARCH on a rectangular-grid problem. Write the 2 differences between Informed and Uninformed Search		L3	5
	c	Formulate an 8-queens problem with a correct and an incorrect solution Comment on protein design problem and role of AI in solving it.		L2	5
OR					
Q.04	a	For an automatic taxi driver application, explain Goal and utility agents with appropriate block diagrams		L2	8
	b	With an algorithm explain Uniform cost Search problem		L2	6
	c	 Write the DFS with pruning for this graph with source node=8 and goal=3. Full steps to be written for full marks.		L3	6
Module-3					
Q. 05	a	 Apply the Greedy best first search to find the solution path from S to G. Write all steps as well as open and closed lists for full marks. S(h=7),A(h=9),B(h=4),C(h=2),D(h=5), E(h=3),G(h=0)		L3	8
	b	Outline a generic knowledge-based agents' program. Write PEAS specification for Wumpus world.		L2	8

	c	Explain Modus ponens and Theory of resolution with examples OR	L2	4
Q. 06	a	<p>apply the A* search to find the solution path from a to z. Heuristics are with nodes, and cost is with edges. Write all steps as well as open and closed lists for full marks</p>	L3	8
	b	Explain contraposition, double implication elimination, demorgans rules with examples. Prove logically that there is no pit in [1,2]	L2	8
	c	Differentiate backward and forward chaining with examples	L2	4
Module-4				
Q. 07	a	Explain various ambiguities in Natural Language processing with examples and summarize in the form of a table about formal languages and their ontological and epistemological commitments	L2	10
	b	<p>Define Universal and Existential Instantiation and give examples for both.</p> <p>Prove the following using Backward and Forward chaining:</p> <p>"As per the law, it is a crime for an American to sell weapons to hostile nations. Country E, an enemy of America, has some missiles, and all the missiles were sold to it by Solan, who is an American citizen."</p> <p>Prove that "Solan is criminal."</p>	L3	10
OR				
Q. 08	a	Explain (i) Unification and (ii) Subsumption Lattice with examples. Write short notes on how First Order Logic can be applied to Wumpus World	L2	10
	b	<p>write appropriate quantifiers for the following</p> <ul style="list-style-type: none"> (i) Some students read well (ii) Some students like some books (iii) Some students like all books (iv) All students like some books (v) All students like no books <p>Explain the concept of Resolution in First Order Logic with appropriate procedure.</p>	L3	10
Module-5				
Q. 09	a	Explain various reasons for failure of First Order Logic Define a sample space for picking 2 tokens from 6 tokens of lab questions with token taken first time is not replaced.	L2	7
	b	Prove all Kolmogorov's axioms (Probability axioms).	L2	7
	c	Given that bus arriving late=0.3 and a student oversleeping probability is 0.4., find the probability that student gets late.	L3	6
OR				
Q. 10	a	Explain marginalization and normalization with a full joint distribution of (toothache, catch, cavity)	L2	8
	b	write the representation of Bayes Theorem. In a class, 70% children were fall sick due to Viral fever and 30% due to Bacterial fever. The probability of observing temperature for Viral is 0.78 and for Bacterial is 0.31. If a child develops high temperature, find the child's probability of having viral infection.	L3	8
	c	Explain the role of probability in solving problems of Wumpus world	L2	4

* Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.