CBCS SCHEME

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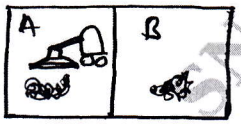
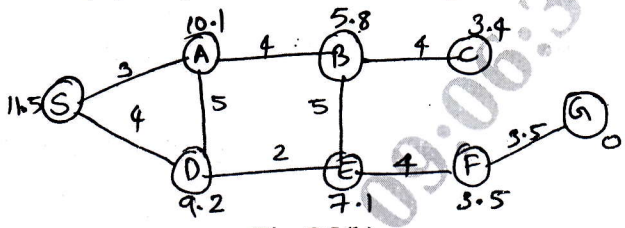
BAD402

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).  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).  Fig.Q5(b)	10	L3	CO3
		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
	b.	Solve the following eight-tile puzzle using heuristic function approach and the tree diagram considering the initial and final states as specified. <table><tr><td>1</td><td>2</td><td>3</td></tr><tr><td></td><td>4</td><td>5</td></tr><tr><td>7</td><td>8</td><td>6</td></tr><tr><td colspan="3">Initial State</td></tr></table> <table><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>4</td><td>5</td><td>6</td></tr><tr><td>7</td><td>8</td><td></td></tr><tr><td colspan="3">Final State</td></tr></table>	10	L2	CO3
		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.	Explain the concept of inference using full joint probability in the context of agents acting under uncertainty with an example of the following variables: Weather = {sunny, rain, cloudy, snow}, Cavity = {cavity, ¬cavity}. Also calculate the following : P(cavity v toothache), P(cavity | toothache), P(¬cavity | toothache), Given the following full joint distribution for the Toothache, Cavity, Catch world.	**10**	**L3**	**CO5**

	Toothache		¬Toothache	
	Catch	¬Catch	Catch	¬Catch
Cavity	0.108	0.012	0.072	0.008
¬Cavity	0.016	0.064	0.144	0.576

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