U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

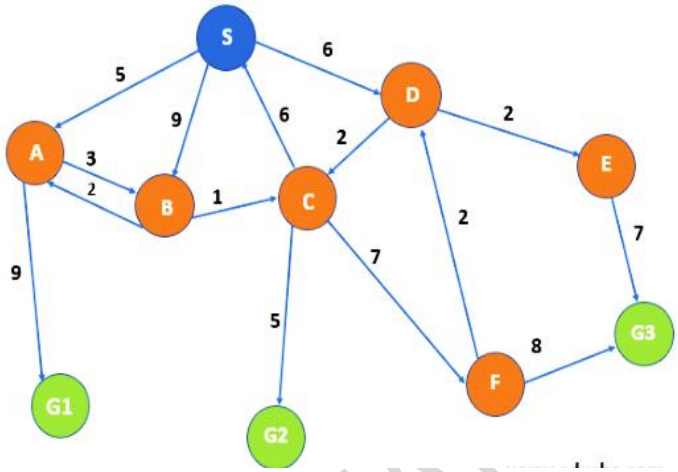
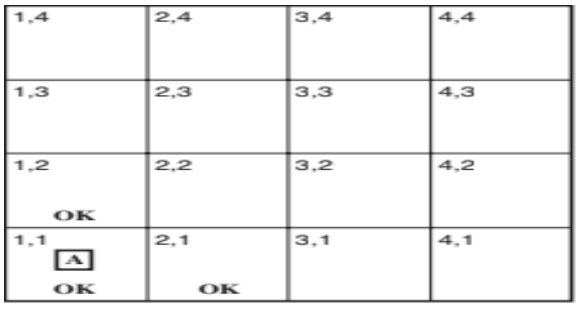
July 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 22CS5PCAIN **Max Marks: 100**
Course: Artificial Intelligence

Instructions: 1. Answer all questions from unit 2, 4 and 5, Internal choice is for unit 1 and 3.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Explain the four categories for defining the Artificial Intelligence.	CO1	PO1	**05**
	b)	With a neat diagram, explain how the agents interact with the environments through sensors and actuators.	CO1	PO1	**05**
	c)	For each of the following activities, give a PEAS description of the task environment and characterize it in terms of the properties of task environment: i. Playing soccer. ii. Exploring the subsurface oceans of Titan. iii. Shopping for used AI books on the Internet. iv. Playing a tennis match. v. Practicing tennis against a wall.	CO1	PO1	**10**
		OR			
2	a)	Define the following terms with an example each: Percept, Percept Sequence, agent function, agent program, Rational Agent.	CO1	PO1	**05**
	b)	Write a function for the TABLE-DRIVEN Agent Program that is invoked for every new percept and explain the structure of agents.	CO1	PO1	**05**
	c)	List the four basic types of agent programs. Explain each type with an example.	CO1	PO1	**10**
		UNIT - II			
3	a)	Consider a state space where the start state is number 1 and each state k has two successors: numbers 2k and 2k + 1. i). Draw the portion of the state space for states 1 to 15. ii). Suppose the goal state is 11. List the order in which nodes will be visited for breadth-first search, depth-limited search with limit 3, and iterative deepening search. iii). How well would bidirectional search work on this problem? What is the branching factor in each direction of the bidirectional search?	CO2	PO2	**10**

			iv). Does the answer to (iii) suggest a reformulation of the problem that would allow you to solve the problem of getting from state 1 to a given goal state with almost no search? v). Call the action going from k to 2k Left, and the action going to 2k + 1 Right. Can you find an algorithm that outputs the solution to this problem without any search at all?			
		b)	Consider the graph below, where we need to reach any one of the destination nodes {G1, G2, G3} starting from node S. Node {A, B, C, D, E and F} are the intermediate nodes. Find the path from S to any of the destination state with the least cumulative cost, using Uniform Cost search strategy.  Design an algorithm for Uniform Cost Search Strategy.	*CO2*	*PO2*	**10**
			UNIT - III			
4		a)	Given a percept, write the function for generic knowledge-based agent where the agent adds the percept to its knowledge-based system. Explain the TELL and ASK operations.	*CO2*	*PO2*	**08**
		b)	Mention the PEAS description of Wumpus World problem with an example and its initial percept sequence.	*CO2*	*PO2*	**08**
		c)	Prove each of the following assertions: i. α is valid if and only if True |= α. ii. For any α, False |= α.	*CO2*	*PO2*	**04**
			OR			
5		a)	Explain different levels of Knowledge based Agent. Give an example for each level.	*CO2*	*PO2*	**08**
		b)	Write the percept sequence at each step in the Wumpus world and find the solution such that the agent reaches the goal state.  	*CO2*	*PO2*	**08**

		c)	List the standard logical equivalences for the Propositional Logic Theorem.	*CO2*	*PO2*	**04**
			UNIT - IV			
	6	a)	Design a forward chaining algorithm. With an example, differentiate forward chaining and backward chaining process.	*CO3*	*PO3*	**08**
		b)	Explain the Conjunctive Normal Form for First Order Logic.	*CO3*	*PO3*	**06**
		c)	Consider the following Knowledge base: i) The humidity is high or the sky is cloudy. ii) If the sky is cloudy, then it will rain. iii) If the humidity is high, then it is hot. iv) It is not hot. Using resolution, prove that "It will rain".	*CO3*	*PO3*	**06**
			UNIT - V			
	7	a)	Consider the following probabilities of a fully joint distribution for a Toothache, Cavity, catch world: <table><tr><td></td><td colspan="2">$toothache$</td><td colspan="2">$\neg toothache$</td></tr><tr><td></td><td>$catch$</td><td>$\neg catch$</td><td>$catch$</td><td>$\neg catch$</td></tr><tr><td>$cavity$</td><td>0.108</td><td>0.012</td><td>0.072</td><td>0.008</td></tr><tr><td>$\neg cavity$</td><td>0.016</td><td>0.064</td><td>0.144</td><td>0.576</td></tr></table>i) Calculate the marginal probability of cavity. ii) Compute the probability of a cavity, given evidence of a toothache iii) Compute the Probability that there is no cavity, given a toothache. iv) Find the normalization constant for the distribution P(Cavity | Toothache).	*CO3*	*PO3*	**08**
		b)	With an example, explain how Bayes' rule can be useful for answering probabilistic queries conditioned on one piece of evidence.	*CO1*	*PO3*	**06**
		c)	Explain the direct sampling methods in approximate inference of Bayesian Networks.	*CO1*	*PO3*	**06**

******