U.S.N.										

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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**

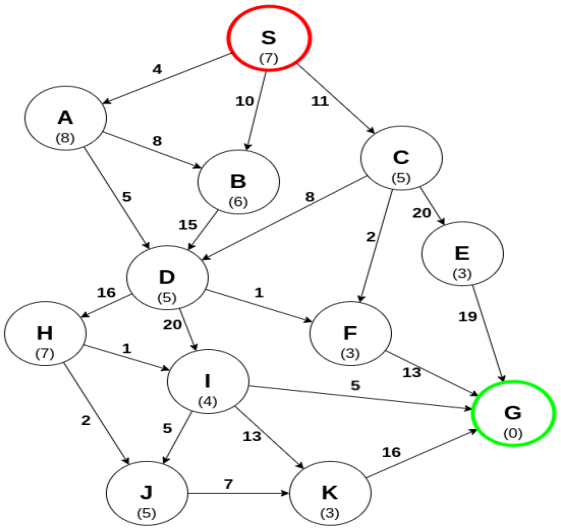
Branch: Artificial Intelligence & Data Science **Duration: 3 hrs.**

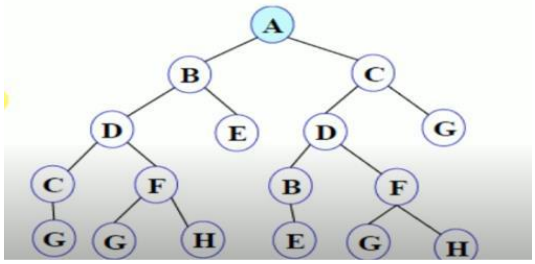
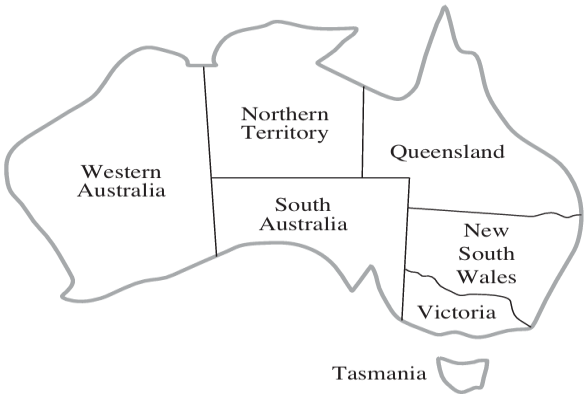
Course Code: 23AI3PCIAI **Max Marks: 100**

Course: Introduction to Artificial Intelligence

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
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)	Define Artificial Intelligence. Explain the Key Factors of Artificial Intelligence.	CO1	PO1	**10**
	b)	Define (a) Intelligence (b) Agent	CO1	PO1	**05**
	c)	Describe the State of Art of AI.	CO1	PO1	**05**
		OR			
2	a)	Explain the concept of Rationality.	CO1	PO1	**06**
	b)	Apply PEAS Description for Self-Driving Car in AI	CO2	PO2	**04**
	c)	What are the general steps in problem solving? Explain problem formulation for the 8 Queen Problem with State space Diagram.	CO1	PO1	**10**
		UNIT - II			
3	a)	Find the shortest path between S to G in the following graph using A* search algorithm 	CO2	PO1	**10**
	b)	Solve the Following Problem using Best First Search Algorithm	CO2	PO2	**05**

			with Start node as A and Goal node as G. 			
		c)	Explain Heuristic Function in Detail.	*CO1*	*PO1*	**05**
			OR			
	4	a)	Give Hill-Climbing algorithm and explain different variants of Hill climbing.	*CO1*	*PO1*	**06**
		b)	Explain the drawbacks of Hill climbing.	*CO1*	*PO1*	**04**
		c)	Give Genetic algorithm. Explain and show how genetic algorithm is illustrated for digit strings representing 8-queens states.	*CO2*	*PO2*	**10**
			UNIT - III			
	5	a)	Explain in detail about Constraint satisfaction Problem.	*CO1*	*PO1*	**05**
		b)	Draw constraint graph by considering the map of Australia which is showing each of its states and territories. Each region is colored in such a way that no neighboring regions have the same color. 	*CO2*	*PO2*	**07**
		c)	Give backtracking algorithm and discuss how Backtracking Search work as a method for solving CSPs.	*CO1*	*PO1*	**08**
			OR			
	6	a)	Show and explain the stages in calculating the optimal decision by applying Alpha beta pruning to the following two-ply game tree.	*CO2*	*PO2*	**10**

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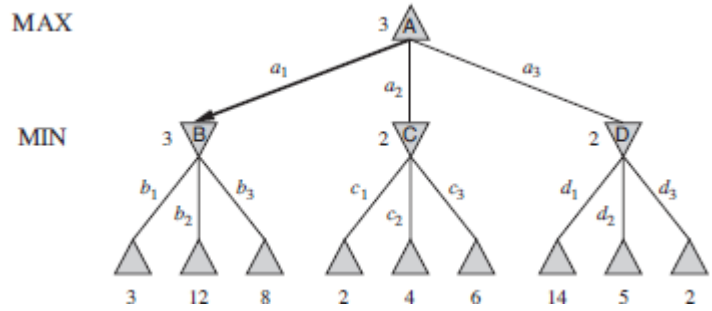
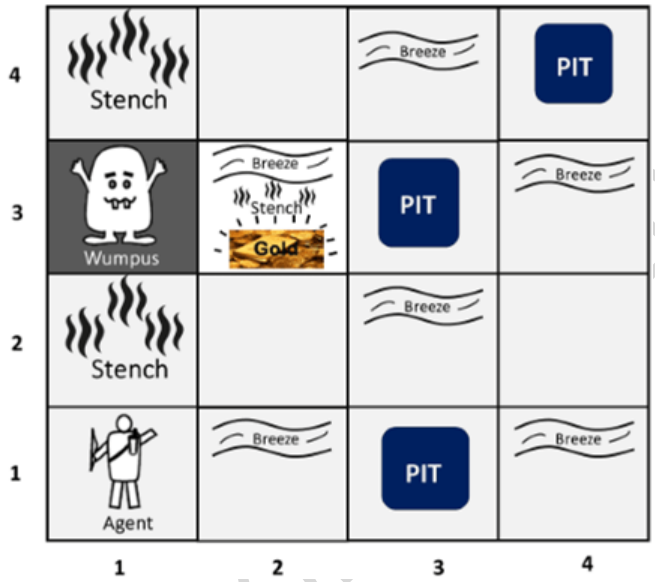
<tr><td></td><td></td><td></td><td> 
</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>b)</td><td>Explain how Kriegspiel can be viewed as a game of incomplete information and the implications of this for game theory.</td><td>CO1</td><td>PO1</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - IV</td><td></td><td></td><td></td></tr>
<tr><td></td><td>7</td><td>a)</td><td>Discuss in detail about knowledge-based Agents.</td><td>CO3</td><td>PO3</td><td>07</td></tr>
<tr><td></td><td></td><td>b)</td><td>Illustrate the syntax of First-Order Logic (FOL) and explain its components with examples.</td><td>CO3</td><td>PO3</td><td>07</td></tr>
<tr><td></td><td></td><td>c)</td><td>Demonstrate the concepts of an assertion and a corresponding query by providing an example within the context of a "Wumpus World" domain.</td><td>CO2</td><td>PO2</td><td>06</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>8</td><td>a)</td><td>Explain the concept of Propositionalizing in the context of First-Order Logic (FOL). Apply propositionalizing to transform the following FOL statement into a propositional logic expression: "∀x (Person(x) → Loves(x, IceCream))"</td><td>CO3</td><td>PO3</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>Explain the concept of Backward Chaining in the context of rule-based reasoning for the problem “The law says that it is a crime for an American to sell weapons to hostile nations. The country Nono, an enemy of America, has some missiles, and all its missiles were sold to it by Colonel West, who is American”. Apply Backward Chaining to determine if the conclusion “Colonel West is a criminal”</td><td>CO3</td><td>PO3</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td>UNIT - V</td><td></td><td></td><td></td></tr>
<tr><td></td><td>9</td><td>a)</td><td>Consider the full joint distribution table shown, discuss about marginal probability, marginalization & conditioning and compute the probability of a cavity and the probability that there is no cavity given the evidence of toothache.
<table>
<tr><td></td><td colspan="2">toothache</td><td colspan="2">¬toothache</td></tr>
<tr><td></td><td>catch</td><td>¬catch</td><td>catch</td><td>¬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>¬cavity</td><td>0.016</td><td>0.064</td><td>0.144</td><td>0.576</td></tr>
</table></td><td>CO3</td><td>PO3</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>Explain about summarizing uncertainty by considering an example of diagnosing a dental patient’s toothache.</td><td>CO1</td><td>PO1</td><td>10</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>10</td><td>a)</td><td>Explain Bayes' Rule and its application in medical diagnosis. How can it help update the probability of a disease given a positive test result?</td><td>CO3</td><td>PO3</td><td>10</td></tr>
</table>

		b)	Solve probabilistic reasoning problem in the following Wumpus world. Suppose the agent starts in the bottom-left corner of a 4x4 grid (position (1,1)) and can sense both a breeze (indicating a nearby pit) and a stench (indicating the presence of the Wumpus). **i.** How should the agent use its sensors (stench and breeze) to deduce the locations of the Wumpus and pits in the Wumpus World? **ii.** Given the following grid, with the agent starting at (1,1), where could the agent safely move to find the gold while avoiding the Wumpus and pits? 	*CO3*	*PO3*	**10**

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