B.N.M. Institute of Technology

An Autonomous Institution under VTU

Department of Artificial Intelligence and Machine Learning
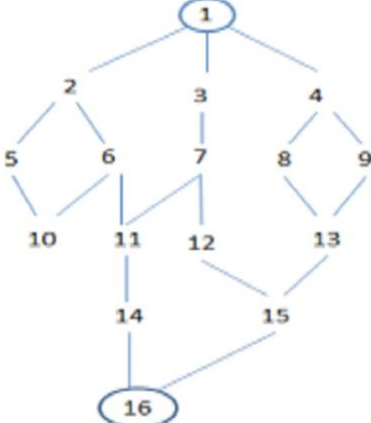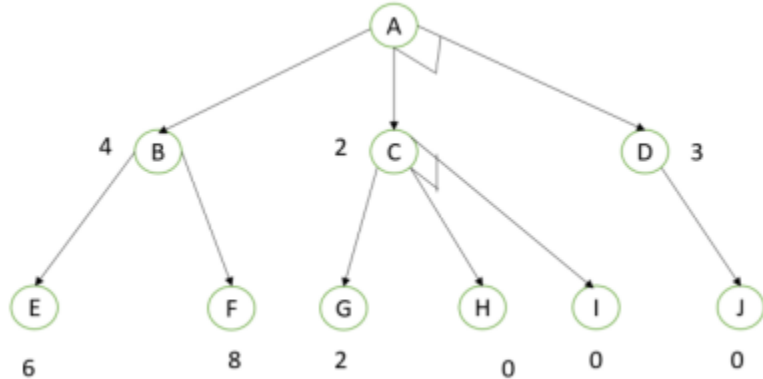### <u>Question Bank</u>

Course name: Artificial Intelligence (PCI)   **Course code:23AML133**
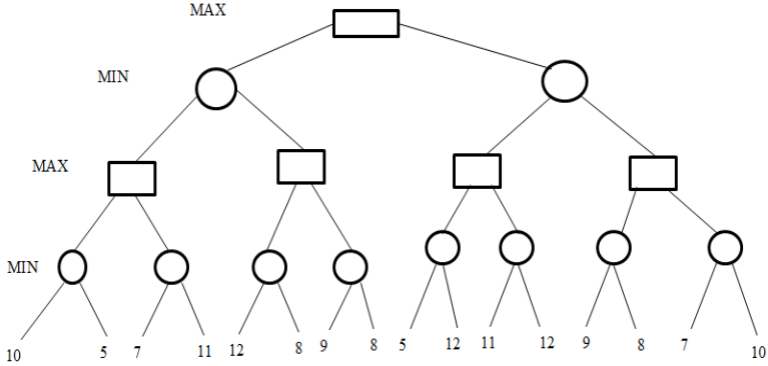**Semester: III A& B**   **Year:2024-25 (ODD)**

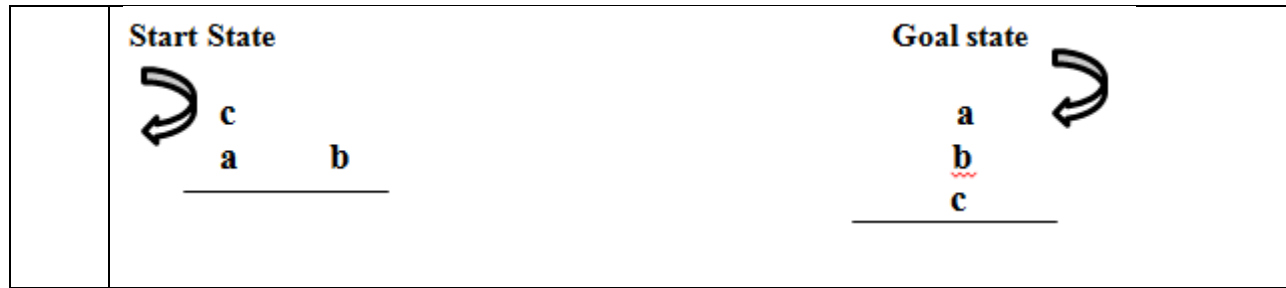| Sl.No	Module-1: Introduction
1.	A Water jug Problem: You are given 2 jugs, 5 gallon-one and a 3-gallon one, a pump which has a unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring marks on it. How can you get exactly 4 gallon of water in the 5-gallon jug? A) Write down the Production rules for the above problem. B) Write any one solution path to the above problem.
2.	Explain the Categorization of Intelligent systems.
3.	A Water jug Problem: You are given 2 jugs, 4 gallon-one and a 3-gallon one, a pump which has a unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring marks on it. How can you get exactly 2 gallon of water in the 4-gallon jug? A) Write down the Production rules for the above problem. B) Write any one solution path to the above problem.
4.	Define Intelligent Systems. Explain the categories of Intelligent systems in detail
5.	Explain in detail the characteristics of AI Problem.
6.	Explain the Control Strategies of General Problem Solving.
7.	3 Missionaries and 3 Cannibals want to cross a river. There is a boat on their side of the river that can be used by either one or two persons. How should they use this boat to cross the river in such a way that cannibals never outnumber missionaries on either side of the river? A) Write down the production rules for the above problem. B) Write any one solution path to the above problem.

8.	3 Missionaries and 3 Cannibals want to cross a river. There is a boat on their side of the river that can be used by either one or two persons. How should they use this boat to cross the river in such a way that cannibals never outnumber missionaries on either side of the river? A) Draw state space tree for the above problem. B) Write any one solution path to the above problem.
9.	Explain about Eliza with its characteristics.
10.	Explain the Components of AI Program
11.	Explain the Applications of Artificial Intelligence system.
12.	Solve 8-Puzzle problem given below
13.	Explain the two views of AI Goals and the Categorization of Intelligent systems.

Item 12 content:

Start State

3	7	6
5	1	2
4		8

Goal State

5	3	6
7		2
4	1	8

Sl.No	**Module-2:Word Level Analysis**
1.	State the algorithm for Breadth- first Search and explain with an example.
2.	Solve 8-Puzzle problem using Depth first Search.
3.	Compare BFS, DFS, DFID and Bidirectional search strategies.
4.	Illustrate the need of intelligent searches in solving Travelling Salesman problem
5.	State the algorithm for Depth- first Search and explain with an example
6.	Write A* Algorithm and Solve the below 8 puzzle problem using A* Algorithm
7.	Solve Water jug Problem (Jug 1: 5G, Jug 2: 3G and goal is 4G water in 5G jug) using Breadth first Search.
8.	State the algorithm for Iterative Deeping Depth first and explain with an example.
9.	Construct Bidirectional state space search tree for the graph shown below.

Item 6 content:

Initial State

2	8	3
1	6	4
7		5

Goal State

1	2	3
8		4
7	6	5

1

2 3 4

5 6 7 8 9

10 11 12 13

14 15

16

10.	State about Depth Limited Search with an example.

11. Write A* Algorithm and Solve the below 8 puzzle problem using A* Algorithm

Initial State

3	7	6
5	1	2
4		8

Goal State

5	3	6
7		2
4	1	8

12. Solve the graph using AO* algorithm with default edge value=1.

A

4 B   2 C   D 3

E   F   G   H   I   J

6   8   2   0   0   0

13.	State the algorithm for AO*
14.	State the algorithm for Branch and bound search (uniform cost search)
15.	State the algorithm for Best first search

16. Solve the crypt arithmetic puzzle. Write the working steps involved in finding the solution.

BASE
+BALL
GAMES

17. Solve the crypt arithmetic puzzle. Write Constraint equations and find one solution using DFS. Show the steps involved in finding the solution.

CROSS
+ ROADS
DANGER

18. Solve the crypt arithmetic puzzle. Write Constraint equations and find one solution using DFS. Show the steps involved in finding the solution.

	T	W	O
+	T	W	O
	F	O	U	R

Sl. No	**Module 3: Game Playing**
1	Explain the description of operators and predicates used in Block World Problem.
2	Consider a Nimgame with 16 sticks in the pile. Draw game trees with A) MAX as the first player B) MIN as the first player
3	Explain any one of the below Planning Systems. 1. Case Based 2. Operator Based 3. Planning algorithm 4. State space linear planning 5. State space non linear planning
4	With reference to Searching a Plan space, Identify the three components of Partial-order plan.
5	Consider a Nimgame with 7 sticks in the pile. Draw game trees with A) MAX as the first player B) MIN as the first player
6	Explain the concept of alpha-beta pruning. Write alpha-beta search algorithm.
7	Write MINMAX Procedure algorithm. Explain by taking Tic Tac Toe Game as example.
8	Apply Alpha Beta Pruning to the graph shown below also traceout the pruned paths.
9	Consider the block world problem given below and solve using STRIPS (Goal Stack) method
10	Consider the blocks below and solve using Sussman Anomaly problem

Start State — Goal state

c
a   b

a
b
c

Sl. No	**Module 4: Logical Reasoning and planning**
1	Prove i. A and (B OR C)is deducted from A and B ii. infer [(A→B) AND (B →C)] →(A→C) Using Natural Deduction Rules.
2	Explain semantic tableau rules in Propositional Logic.
3	Draw Resolution Graph for: i. Check whether The ground goal← grandmother ("Mary", "Mike") is true. ii. Check whether The non-ground goal ←grandmother ("X", "Mita") is true.
4	Explain the three types of Resolution methods with example.
5	Find the resolvent of two clauses CL1 and CL2 where p, q and r are predicate symbols, X is avariable and f is a unary function. CL1=p(X) V q(X) CL2= ~p(f(X)) V r(X)
6	Anything any one eats is called food. Mita likes all kinds of food. Burger is a food. Mango is a food. John eats pizza. John eats everything Mita eats " Construct these sentences into formulae in predicate logic and then to program clauses. Use resolution algorithm to answer the following. i. What food does John eat? ii.Does Mita like pizza? iii.Which food does John Like? iv.Who likes what foods? v. Prove the statement "Mita likes pizza and burger" using resolution.
7	What is predicate logic? Explain the predicate logic representation with reference to suitable example.
8	Prove the theorem infer [(A → B) ∧ (B → C)] → (A → C) using Natural Deduction system.
9	Show the following is a valid argument using propositional logic: " If it is humid, then it will rain and since it is humid, today it will rain"
10	Apply Resolution refutation principle to solve C V D is a logical consequence of S = { A V B, ~A V D, C V ~B }
11	Write Semantic Tableau rules for alpha beta and apply the same to check whether the following formula is consistent or inconsistent. { ~(AVB),(B-->C),(AVC)}
12	Establish that A->C is a deductive consequence of

{A->B, B->C}, i.e., {A->B, B->C}|- (A-> C)

Sl. No	**Module 5: Knowledge Representation & Expert Systems**
1	Explain in detail about approaches to knowledge representation.
2	Write a note on: i.Forward Reasoning Inference. ii. Backward Reasoning Inference.
3	Define a network of frame system for hospitals, with graphical representation.
4	With a neat diagram explain the architecture of an Expert System.
5	Write the difference between Expert systems versus Traditional systems.
6	Write the advantages and disadvantages of Expert systems.
7	Identify the Characteristics of Expert systems.
8	List the advantages and disadvantages of Expert systems.