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Reg. No. : 21BCE1808

Final Assessment Test (FAT) - May 2024

Programme	**B.Tech.**	Semester	**WINTER SEMESTER 2023 - 24**
Course Title	**ARTIFICIAL INTELLIGENCE**	Course Code	**BCSE306L**
Faculty Name	**Prof. Abirami S**	Slot	**C1+TC1**
		Class Nbr	**CH2023240501419**
Time	**3 Hours**	Max. Marks	**100**

General Instructions:

- Write only Register Number in the Question Paper where space is provided (right-side at the top) & do not write any other details.

Section - I

Answer all questions (4 X 10 Marks = 40 Marks)

01. The vacuum cleaner problem is a well-known agent-based search problem. In this problem, there are two rooms whose shape is given in the below figure. Assume the vacuum cleaner agent is presented in any one of these rooms. There is dirt in both the rooms and the purpose of deploying the agent is to clean both the rooms. **[10]**

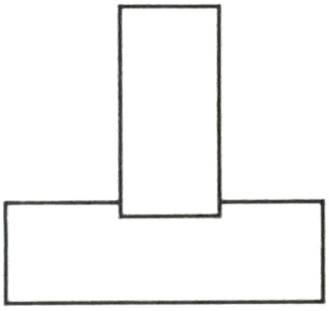
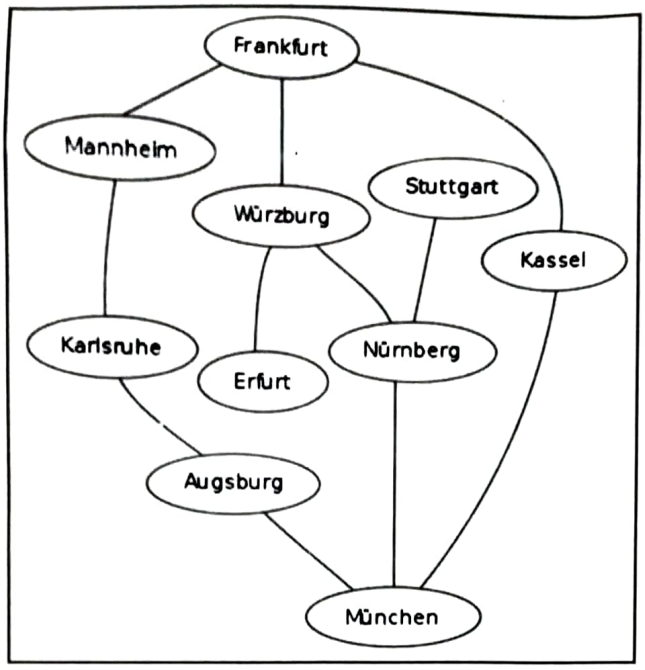


Figure: Shape of Two Rooms

i)Formulate the given problem as a search space problem by specifying the state space graph with the problem formulation steps. (6 Marks)

ii)Assume that the initial state as **two rooms having dust** and the goal state as **two rooms clean**. Show a simple search strategy that would create a search tree to find a path from the initial state to the goal state. (4 Marks)

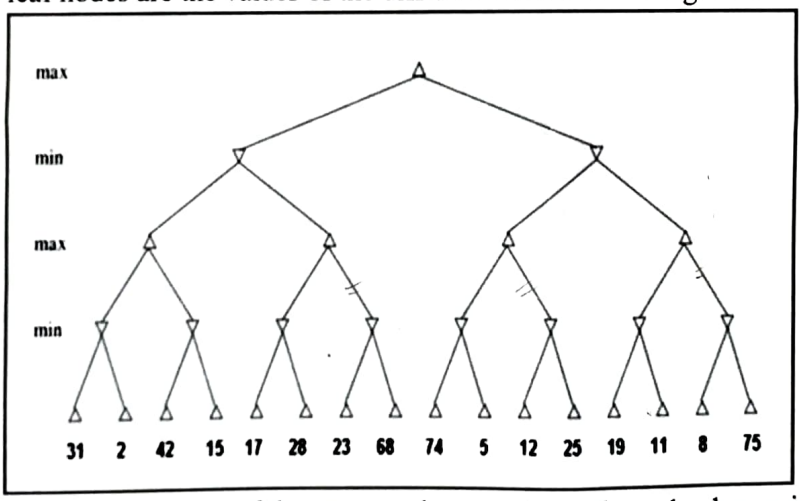
02. Consider the simplified road map of Southern Germany, as shown in figure. The length of each arc is considered as one. **[10]**



a) Apply Iterative Deepening search algorithm for the given graph, for starting at Frankfurt and reaching Munchen. Discuss its performance metrics. (6 Marks)

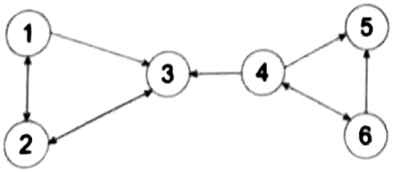
b) Compare the performance of Iterative Deepening search and Depth Limited search for depth = 3. (4 Marks)

03. Consider the game tree shown below. Assume the root node is a max node. The numbers in the leaf nodes are the values of the different outcomes of the game to the max player. **[10]**



Compute the value of the game to the max player through adversarial search technique by eliminating the branches that cannot possibly influence the final decision

04. Imagine you're the architect of an intricate web of interconnected realms, each represented by a node in the page graph given below. Each realm craves recognition, much like page ranks. With a teleport factor of 0.8, delve into the depths of this realm-web, predicting the standings of each domain after the second iteration. **[10]**



Section - II

Answer all questions (4 X 15 Marks = 60 Marks)

05. Suggest a type of intelligent agent suitable for designing a system that can clean places as needed, equipped with appropriate sensors and actuators, considering three possible percepts (clean, partially dirty, and dirty) and five possible actions (turn right, turn left, apply vacuum, apply strong vacuum, NoOperation). **[15]**

(i) Justify your answer providing necessary diagrams. (8 marks)

(ii) Discuss its 'task environment' specifying the environment category. (7 marks)

06. (i) A knowledgebase (KB) has the following horn clauses **[15]**

A1: $\neg a \vee \neg b \vee d$

A2: $\neg d \vee \neg e \vee f$

A3: $\neg d \vee \neg c \vee \neg f \vee g$

A4: $\neg b \vee \neg c \vee e$

Also, the following facts are present in the KB

F1: a

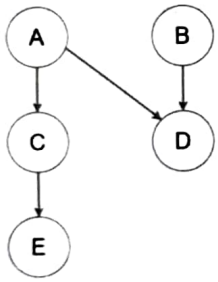
F2: b

F3: c

Derive the sentence "g" by applying data driven and goal driven inference techniques. (9 marks)

(ii) Represent the given sentence "If the sun is shining, then I am going to the ball game" in propositional logic. Check if the negation of the given sentence is equivalent to "The sun is shining, and I am not going to the ball game." (6 marks)

07. Consider the following Bayesian network: **[15]**



The Bayesian network records the following probabilities:

P(A=T) = 0.3

P(B=T) = 0.6

P(C=T|A=T) = 0.8

P(C=T|A=F) = 0.4

P(D=T|A=T,B=T) = 0.7

P(D=T|A=T,B=F) = 0.8

P(D=T|A=F,B=T) = 0.1

P(D=T|A=F,B=F) = 0.2

P(E=T|C=T) = 0.7

P(E=T|C=F) = 0.2

For the given network, calculate the following probabilities:

(i) P(D=T) (5 Marks)

(ii) P(D=F,C=T) (5 Marks)

(iii) P(A=T|D=F) (5 Marks)

08. Imagine three color blocks stacked one over the other on the ground in the order: green, red, blue (with green on the ground). The task is to rearrange the stacking of blocks in the order: red, green, blue (with red on the ground) using the actions *'move'*, *'from_ground'*, and *'to_ground'*. The condition is that only one block can be moved at a time, and a box with another box stacked on top of it cannot be moved. **[15]**

(i) Create a problem formulation to outline the initial state, goal state, and action schema using PDDL. (8 Marks)

(ii) Utilize a hierarchical planning approach to formulate a plan for the given task.(7 Marks)