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Question Paper Code: U6203

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Sixth Semester

Computer Science Engineering

21UCS603 - ARTIFICIAL INTELLLIGENCE AND MACHINE LEARNING

(Common to Information technology)

(Regulation 2021)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1.	Differentiate uninformed and informed search strategies .	CO1 - U
2.	Why problem formulation must follow the goal formulation?	CO1 - U
3.	Decide whether each of the following sentences is valid , unsatisfiable or neither. Verify your decisions using truth tables or the equivalence rules. Smoke→Smoke, Smoke→Fire, Smoke V Fire V¬Fire	CO2 -App
4.	Given the following statements represented by the variables A, B, and C, translate the following sentence into propositional logic. A – Alice is elected secretary. B – Bert is elected governor. C – Calvin is elected treasurer. If Alice is elected secretary, then either Bert is elected governor or Calvin is elected treasurer.	CO2 -App
5.	Define Markov Blanket with example	CO1 - U
6.	What are the other approaches to uncertain reasoning?	CO1 - U
7.	Mention the different forms of learning.	CO1 - U
8.	What is over fitting?	CO1 - U
9.	Describe the concept of single link and complete link in the context of hierarchical clustering.	CO1 - U
10.	What is dendrogram? Explain its uses.	CO1 - U

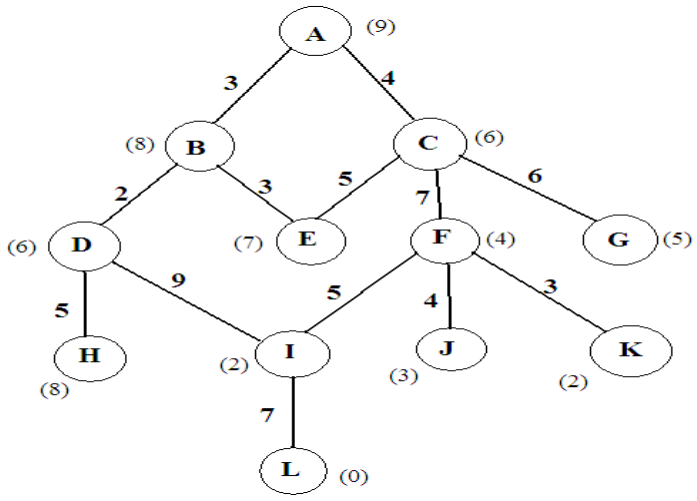
PART – B (5 x 16= 80 Marks)

11. (a) Consider the tree shown below. The numbers on the arcs are the arc lengths. Assume that the nodes are expanded in alphabetical order when no other order is specified by the search, and that the goal is state L. No visited or expanded lists are used. What order would the states be expanded by each type of search? Stop when you expand G. Write only the sequence of states expanded by the following search. CO2-App (16)

a) Breadth-first search

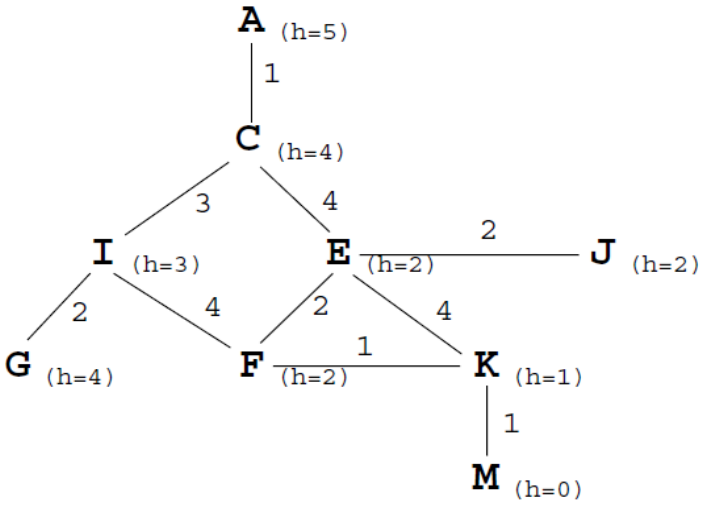
b) Depth-first search

c) Uniform-Cost Search



Or

(b) Consider the above search tree. Each node is labelled with a unique letter. The start node for search is A, and the destination is M. The cost of each edge is shown on the edge. The heuristic value h for the node is shown next to that node in parenthesis. For each of the following search algorithms, show the order in which the nodes are examined. If there is ambiguity or choice about which node goes next, pick the node that is leftmost in the tree. Terminate the search once the goal node is reached. Show the Resultant tree and List of States for i)Greedy Search. ii) A* Search. CO2-App (16)



12. (a) Consider the following facts: CO2-App (16)

1. Ravi likes all kind of food.
2. Apples and chicken are food
3. Anything anyone eats and is not killed is food
4. Ajay eats peanuts and is still alive
5. Rita eats everything that Ajay eats

(a) Translate these sentences into formulas in predicate logic.

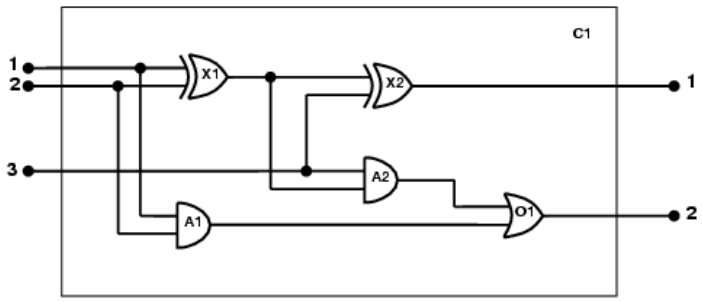
(b) Convert the formulas of a part into clause form.

(c) Prove by Resolution that "Ravi likes peanuts.

(d) Use Forward Chaining to prove that "what food Rita eats"

Or

(b) Illustrate the various steps associated with the knowledge engineering Process for the following one bit full adder. CO2-App (16)



13. (a) Create a Bayesian network for car diagnosis(A Bayesian network describing some features of a car's electrical system and engine. Each variable is Boolean, and the true value indicates that the corresponding aspect of the vehicle is in working order.) CO2-App (16)

a. Extend the network with the Boolean variables Ice Weather and Starter/Victor.

b. Give reasonable conditional probability tables for all the nodes.

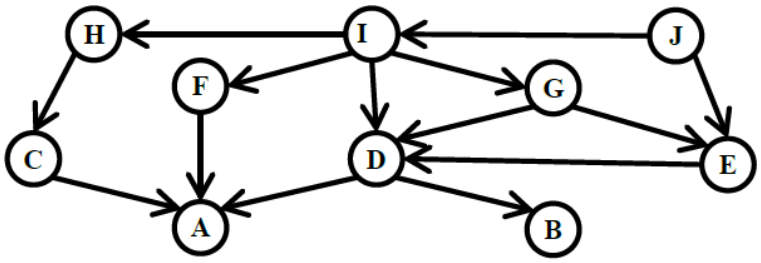
c. How many independent values are contained in the joint probability distribution for eight Boolean nodes, assuming that no conditional independence relations are known to hold among them?

d. How many independent probability values do your network tables contain?

e. The conditional distribution for Starts could be described as a noisy-AND distribution. Define this family in general and relate it to the noisy-OR distribution.

Or

(b) Write down the factored conditional probability expression that corresponds to the graphical Bayesian Network shown. CO2-App (16)



Draw the Bayesian Network that corresponds to this conditional probability:

P(A | D,F,H,I) P(B | D, E,G, J) P(C | H) P(D | G) P(E| J) P(F | H) P(G | I, J) P(H) P(I) P(J)

14. (a) Consider a fictional dataset that describes the weather conditions for playing a game of golf. Given the weather conditions, each tuple classifies the conditions as fit("Yes") or unfit("No") for playing golf. **Design a Decision Tree** for the dataset and test the chance of playing golf if the weather condition today = (Sunny, Hot, Normal, False) CO2-App (16)

	Outlook	Temperature	Humidity	Windy	Play Golf
0	Rainy	Hot	High	False	No
1	Rainy	Hot	High	True	No
2	Overcast	Hot	High	False	Yes
3	Sunny	Mild	High	False	Yes
4	Sunny	Cool	Normal	False	Yes
5	Sunny	Cool	Normal	True	No
6	Overcast	Cool	Normal	True	Yes
7	Rainy	Mild	High	False	No
8	Rainy	Cool	Normal	False	Yes
9	Sunny	Mild	Normal	False	Yes
10	Rainy	Mild	Normal	True	Yes
11	Overcast	Mild	High	True	Yes
12	Overcast	Hot	Normal	False	Yes
13	Sunny	Mild	High	True	No

Or

(b) You are an agricultural robot given the following set of plant examples. Each is assigned a class label of + or — depending on whether or not it is a member of the target class: CO2-App (16)

Example	Vine?	Fruit?	Leaf?	Class
Watermelon	Yes	Yes	Curly	+
Ivy	Yes	No	Curly	—
Bougainvillea	Yes	No	Flat	—
Kudzu	Yes	No	Flat	—
Maple	No	No	Curly	+
Oak	No	No	Flat	+
Sycamore	No	No	Flat	+
Apple	No	Yes	Curly	—

Draw the decision tree that would be constructed by recursively applying information gain to select roots of sub-trees, as in the Decision-Tree-Learning algorithm

What class is Grape? (Vine=Yes, Fruit=Yes, Leaf=Curly) ?

What class is Orange? (Vine=No, Fruit=Yes, Leaf=Curly)?

15. (a) Apply any one clustering to the following 8 examples to convert into them into no of clusters: A1=(2,10), A2=(2,5), A3=(8,4), A4=(5,8), A5=(7,5), A6=(6,4), A7=(1,2), A8=(4,9). CO2-App (16)

Or

(b) Apply Fuzzy C means clustering to the following examples to convert into them into two clusters: A1=(1,3), A2=(1.5,3.2), A3=(1.3,2.5), A4=(3,1). CO2-App (16)