

## Sixth Semester Bachelor of Engineering Examination

## AI AND MACHINE LEARNING

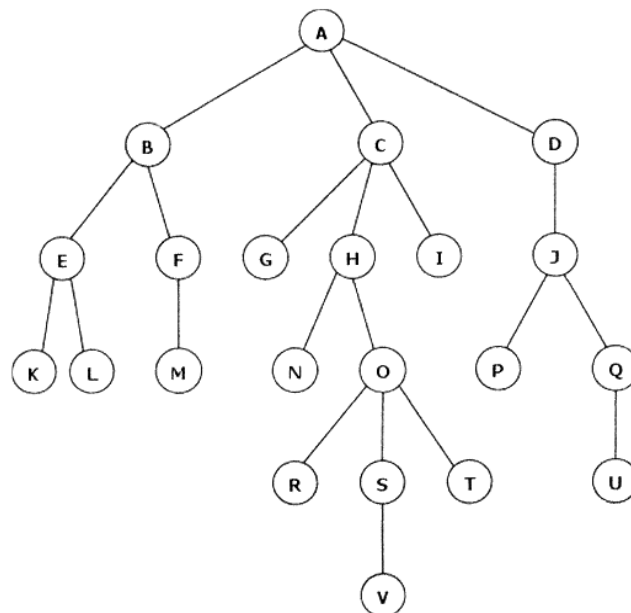
Time : 2 Hours ]

[ Max. Marks : 40

**Instructions to Candidates :—**

- (1) All questions carry marks as indicated against them.
- (2) Assume suitable data wherever necessary.
- (3) Draw neat sketches wherever necessary.

1. (a) Consider the following state space where the start state node is A and Goal Node is U



List the order in which the nodes will be visited for :

- Breadth First Search
- Depth First Search

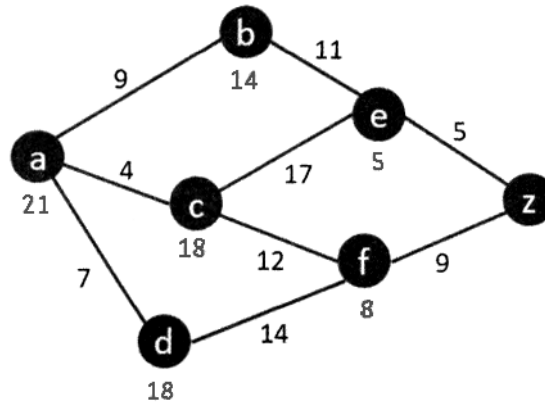
4(CO1)

- (b) **A Water Jug Problem** : You are given two jugs, a 5-Liter and 11-Liter one, a pump which has unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. How can you get exactly 4 Liter of water in the 5-Liter jug ? Show the various steps and also mention the rule applied to each step.

4(CO1)

2. (a) Consider the following figure, where 'a' is the start node and 'z' is the goal node.

Apply A\* algorithm to find the path from 'a' to 'z'. Heuristic values [h] for the nodes are : a: 21, b = 14, c = 18, d = 18, e = 5, f = 8.



5(CO1)

3. (a) Apply Decision Tree Classifier algorithm in order to find out the root node of the tree and also construct the decision tree and decision rules. Annual Income is categorized into two categories [ $<80K$  and  $>80K$ ].

RID	Home Owner	Marital Status	Annual Income	Defaulted Borrower
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes

7(CO2)

4. Use single, complete and average link agglomerative clustering to group the data described by the following distance matrix. Produce the dendrograms.

	1	2	3	4	5
1	0				
2	8	0			
3	2	6	0		
4	5	4	8	0	
5	10	9	1	7	0

7(CO2)

5. Design a radial basis function network to solve the nonlinear XOR problem.

7(CO3)

6. Apply Naïve Bayes classification algorithm to predict whether Red, Domestic, SUV car is stolen or not ?

Example No.	Color	Type	Origin	Stolen ?
1	Red	Sports	Domestic	Yes
2	Red	Sports	Domestic	No
3	Red	Sports	Domestic	Yes
4	Yellow	Sports	Domestic	No
5	Yellow	Sports	Imported	Yes
6	Yellow	SUV	Imported	No
7	Yellow	SUV	Imported	Yes
8	Yellow	SUV	Domestic	No
9	Red	SUV	Imported	No
10	Red	Sports	Imported	Yes

6(CO2,4)

