Final Assessment Test – April 2019

VIT
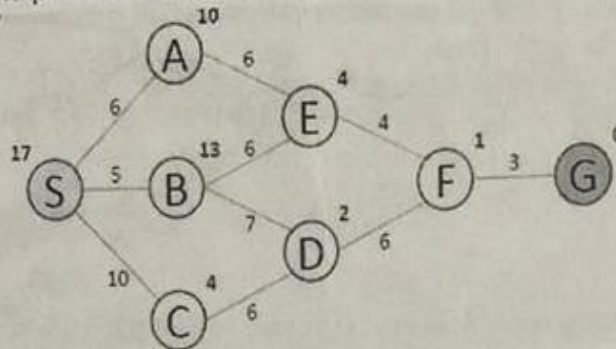
Vellore Institute of Technology

Course: CSE3013 - Artificial Intelligence
Class NBR(s): 2902 / 2904 / 2906 / 2908 / 2910 / 2912/2914/5726
Time: **Three Hours**

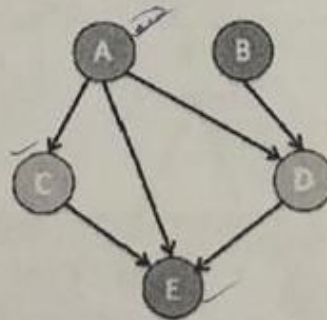Slot: B2+TB2

Max. Marks: 100

Answer any TEN Questions
(10 X 10 = 100 Marks)

1. With appropriate block diagrams explain the structure of goal based agents and utility based agents.

2. Compare and discuss in brief on Breadth First Search, Depth First Search, Depth limited search, Iterative deepening and uniform cost search in terms of various performance metrics like time, space, completeness and optimality.

3. Write the A* algorithm and perform it on the following graph to find the optimal path and path cost.
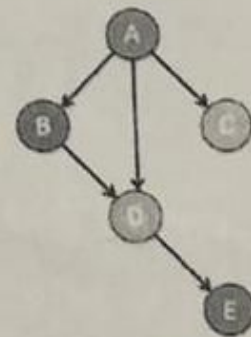

4. From "Horses are animals," it follows that "The head of a horse is the head of an animal." Demonstrate that this inference is valid by carrying out the following steps:

   a. Translate the premise and the conclusion into the language of first-order logic. Use three
      Predicates: HeadOf (h, x) (meaning "h is the head of x"), Horse(x), and Animal (x).
   b. Negate the conclusion, and convert the premise and the negated conclusion into conjunctive normal form.
   c. Use resolution to show that the conclusion follows from the premise.

5. You are given two different Bayesian network structures 1 and 2, each consisting of 5 binary random variables A, B, C, D, E. Each variable corresponds to a gene, whose expression can be either "ON" or "OFF".

   For each of the following cases, factor P(A,B,C,D,E) according to the independencies specified and give the minimum number of parameters required to fully specify the distribution.

Network 1

Network 2

   (i)   A,B,C,D,E are all mutually independent
   (ii) A,B,C,D,E follow the independence assumptions of Network #1 above
   (iii) A,B,C,D,E follow the independence assumptions of Network #2 above
   (iv) No independencies

6. The following table contains training examples that help to predict whether a patient is likely to have a heart attack.

PATIENT ID	CHEST PAIN?	MALE?	SMOKES?	EXERCISES?	HEART ATTACK?
1.	yes	yes	no	yes	yes
2.	yes	yes	yes	no	yes
3.	no	no	yes	no	yes
4.	no	yes	no	yes	no
5.	yes	no	yes	yes	yes
6.	no	yes	yes	yes	no

Use information theory to construct a minimal decision tree that predicts whether or not a patient is likely to have a heart attack.

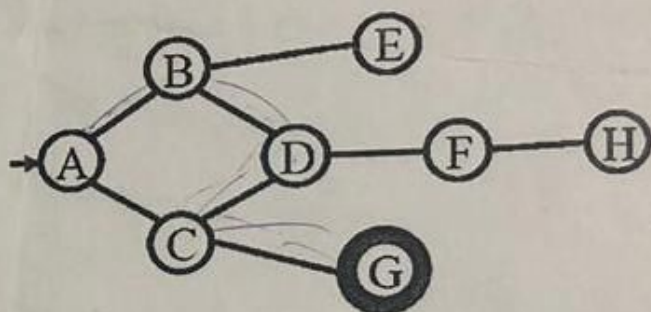| x	1	1/4	2/3	3/4	1/3	1/2
log_2(x)	0	-2	-0.6	-0.4	-1.6	-1

i. Select the attribute for the root node
ii. Translate your decision tree into a collection of decision rules.

7. List the stages of expert system development life cycle and give brief note on each stages with a block diagram. Also explain the overall architecture of expert systems and the components.
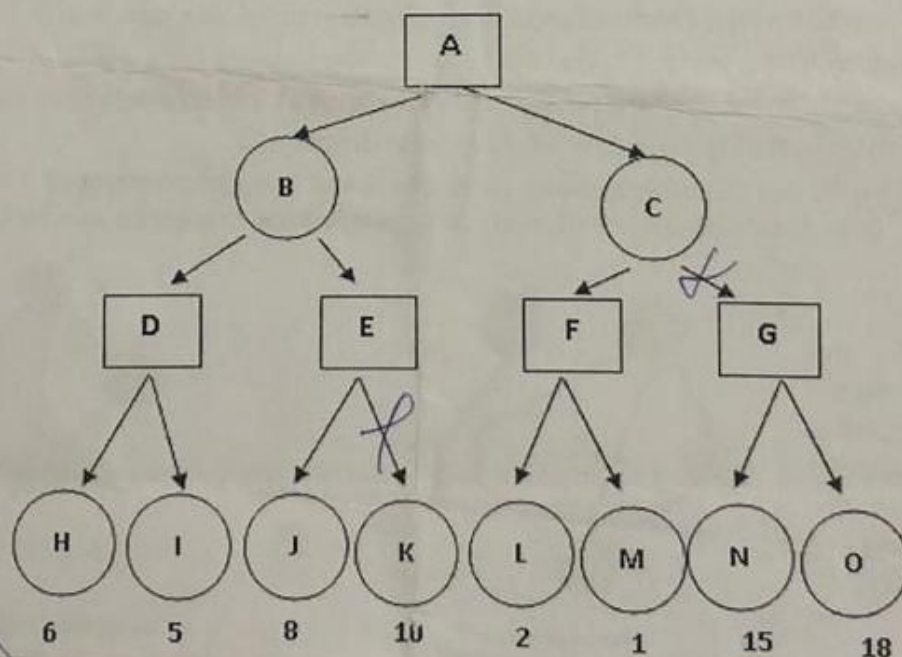
8. Define supervised machine learning and explain the basic structure of artificial neural network with one hidden layer and ten inputs. Also draw the simple mathematical model of a neuron.

9. Consider the following graph

Write the DFS routine. Starting from state A, execute DFS. The goal node is G. Show the order in which the nodes are expanded. Assume that the alphabetically smaller node is expanded first to break ties.

10. Given the following search tree, apply mini-max algorithm to find the backed up values in the nodes by having node A as MAX and apply alpha-beta pruning algorithm to it and show the search tree that would be built by this algorithm. Make sure that you show where the alpha and beta cuts are applied and which parts of the search tree are pruned as a result.

11. Write detailed notes on any two major architectures of deep learning network with neat diagram.

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