Final Assessment Test – May 2024

VIT
Vellore Institute of Technology

Course: **BCSE306L** - **Artificial Intelligence**
Class NBR(s): 0562/0572/0578/0587/0593/0598/
0607/0617/0623/0630/0636/0639/0641/0644/   Slot: **B1+TB1**
0655/0661/0670/0680/0692/0699/0708/0716/0725
/0734/0746
Time: **Three Hours**   Max. Marks: **100**

KEEPING MOBILE PHONE/ELECTRONIC DEVICES EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE

➤ KEEPING MOBILE PHONE/ELECTRONIC DEVICES EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
➤ DON'T WRITE ANYTHING ON THE QUESTION PAPER

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

1. a) The Robird is a drone developed by Clear Flight Solutions, that is good for **[6+4]**
    controlling other birds. The Robird looks and flies exactly like a real raptor
    would, which makes the natural birds react like they would in the presence
    of a real predator. The Robird is used to clear runways from birds so flights
    can take off safely, and to keep birds away from industrial or agricultural
    areas. There are two Robirds built, one looks like a Peregrine Falcon, and
    the other looks like an Eagle. The Eagle is an alpha predator, while the
    Peregrine Falcon is the most common predator across the world. Clear
    Flight Solutions chooses which Robird to use depending on the local bird
    population. The good thing about using the Robird is that the bird
    populations quickly learn that a predator is in the area, and stay away. Give
    the PEAS for the Robird robot.

    b) Explain the architecture of goal based agents with suitable diagram.

2. Four soldiers need to cross a river. One of them is arrogant (A), one is lazy(L)
   and two are brave (B1 & B2).

    Rules:

    - The raft can hold a maximum of two soldiers at a time.
    - The lazy soldier will not be alone either on the raft or on the banks.
    - The arrogant one will not travel on the raft with anyone else.
    - Everyone can row and the raft cannot row itself.

    Model the problem with each state represented in the following order:
    (A, L, B1, B2). Represent it with bits 0/1 to indicate the bank in which the soldier
    is. 1 represents that the soldier is in Left bank, 0 represents the soldier is in
    the right bank. Shade the restricted states. Initial state: 1111; Final state
    is: 0000. Draw the search space and search for the solution using DFS. List the
    order of traversal.

3. Perform GBFS on the given graph. Prove that A* search algorithm returns the optimal solution on the graph below to find the shortest path from node S to node G. Each node is labelled with a capital letter and the value of a heuristic function. Each edge is labelled by the cost to traverse that edge. Analyse the path cost obtained by both the algorithms.
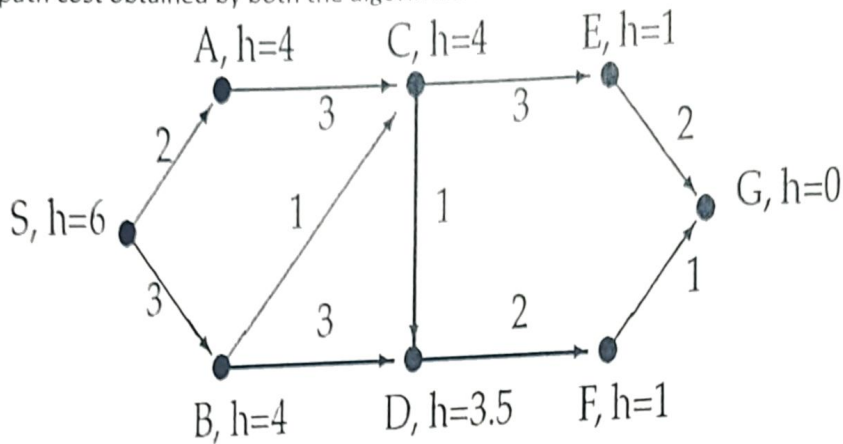
4.
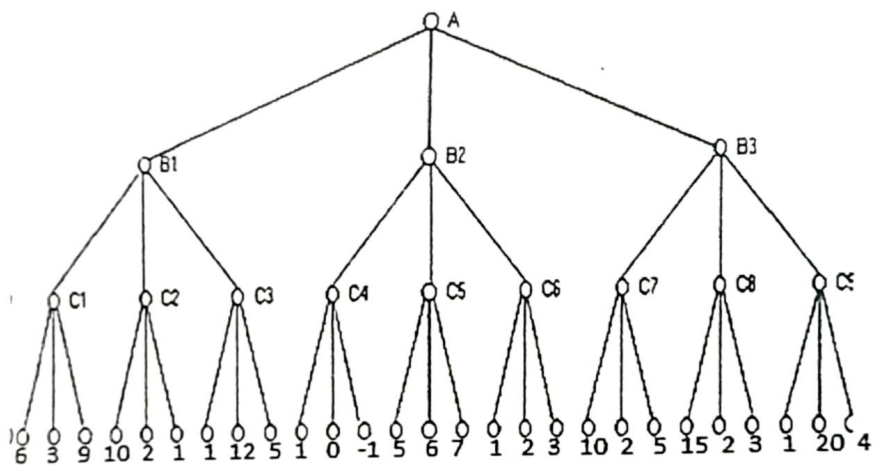
Find the minimax values of the nodes using Mini-Max Algorithm. Prune the nodes that do not affect the game's outcome using α-β pruning algorithm.

5. Convert the given knowledge base to FOL. Prove that "**Percy Jackson defeats the minotaur**" entails from the given knowledge base using **resolution**.
Knowledge Base:
Percy Jackson is a demigod. One becomes a demigod when one's parent is a God. Percy Jackson's parent is the powerful God Poseidon. The children of powerful Gods are powerful/. Powerful monsters are imprisoned. The powerful monster Minotaur is imprisoned. Powerful monsters can only be defeated by powerful demigods.
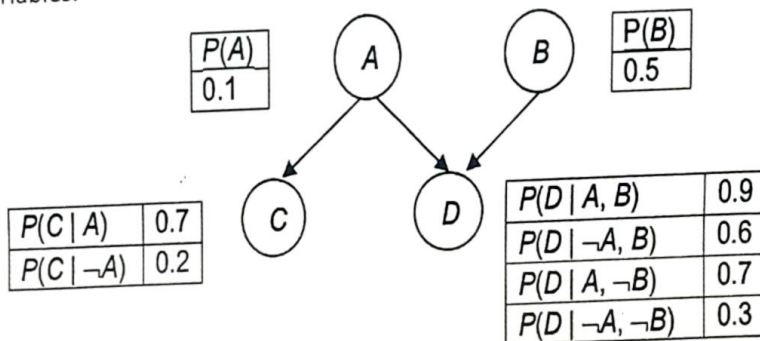
6. a) In VIT there are two faculty members who teach AI. One faculty member **[5]** has a pass percentage of 50% and the other faculty member's pass percentage is 90%. You would want to join the class of the faculty member who has the higher pass percentage. But you do not know who that is. So, you assume that they are equally likely to be lenient and join the class of one faculty member. Given that you failed, what is the probability that the faculty member whom you chose was faculty with the high pass percentage?

b) For two events A and B, the following probability are given P(A)= 0.6, P(B)= 0.2, P(A|B)=0.5

Use the appropriate laws of probability to calculate

I.	$P(\bar{A})$	**[1]**
II.	P(A∪B)	**[1]**
III.	P(A∩B)	**[1]**
IV.	P(B|A)	**[2]**

7. Consider the following Bayesian Network containing four Boolean random variables.

$P(A)$	
0.1	

A

B

$P(B)$	
0.5	

$P(C\|A)$	0.7
$P(C\|\neg A)$	0.2

C

D

$P(D\|A, B)$	0.9
$P(D\|\neg A, B)$	0.6
$P(D\|A, \neg B)$	0.7
$P(D\|\neg A, \neg B)$	0.3

[5+5]

a) Compute P(¬A, B, ¬C, D)
b) Compute P(A | B, C, D)

8. An agent in Vellore, India wants to spend his vacation in Paris, France. Plan his trip using hierarchical task network planning. Write the actions with its corresponding preconditions and effects in STRIPS.

9.

Start State   Goal State
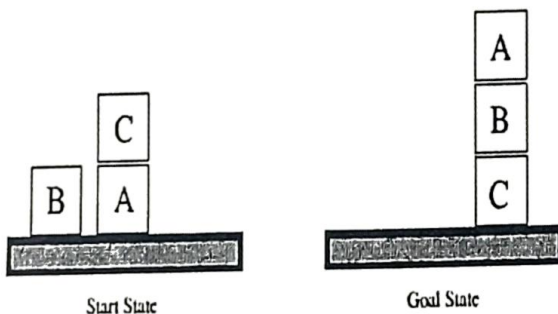
A) Give generic representations of actions along with the preconditions and **[6+4]** effects in STRIPS that can be used in the blocks world problem. Write a suitable plan of actions to reach the goal state from the start state.

B) Write a short note on planning in nondeterministic domain.

10. Develop an NLP model to create a calendar entry from email received. Explain the approach that you would select to perform the task with suitable example.

[6]

11. a) Using the laws of inference prove that "T->W" entails from the given KB.

KB:
-P -> R ^ -S
T-> S
U -> -P
-W
U V W

[4]

b) Prove (P^Q)→(P V R) is a tautology using Truth Table.

12. Explain Hill Climbing Search Algorithm. What are the advantages and disadvantages of the algorithm? What is the strategy used in Simulated Annealing that helps it to escape Local Minima?

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