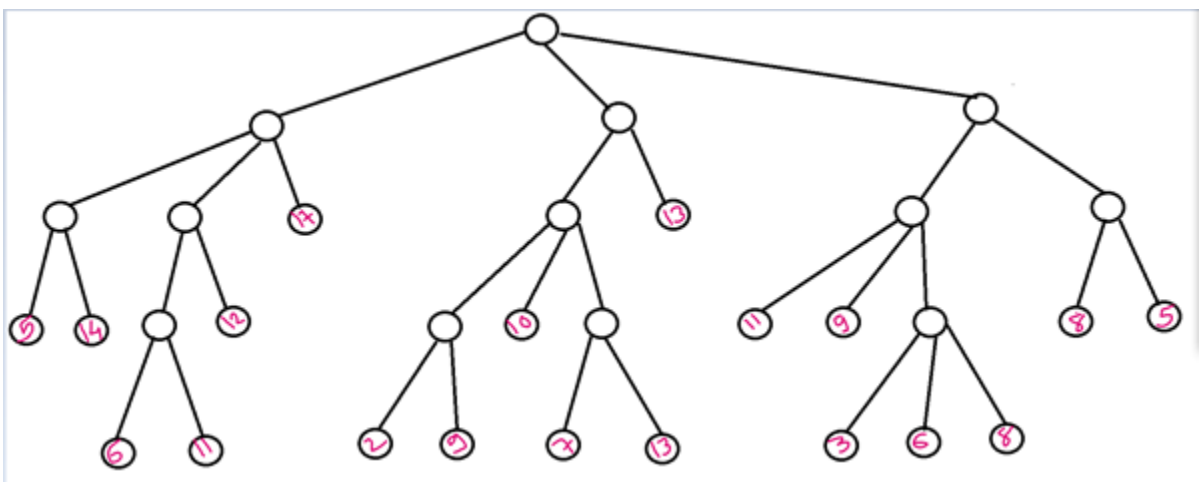
Enrollment No: _____

GANPAT UNIVERSITY
B. TECH (COMPUTER ENGINEERING/INFORMATION TECHNOLOGY) SEM - VI
REGULAR EXAMINATION APRIL - JUNE 2021
2CEIT602: ARTIFICIAL INTELLIGENCE

Time: 1.5 Hours **Total Marks: 30**

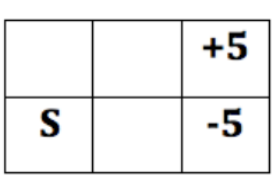
Q-1 Generate DFS search trees for the given water jug problem having two jugs capacity as 16-liter and 7-liter. There is a pump from which you can pour unlimited water into the jug. There are no any measuring marks given on the jug. How will you exactly 8 liter of water in the 16-liter jug? Also write the rules of the given water jug problems. **[4]**

Q-2 Explain MiniMax search procedure in detail for game playing. Apply alpha-beta pruning technique on the given search tree. Mark each point for alpha cutoff and beta cutoff. Make sure that you have to show where the alpha and beta cuts are applied and which parts of the search tree are pruned as a result. **[5]**

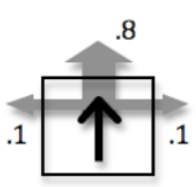


Q-3 Draw the network having an input layer with three nodes, a hidden layer with three nodes and an output node. **[6]**
Find the new weights when the given data as:
Inputs are [0.5 0.7 0].
The weights for the hidden layer nodes from the respective inputs are [2 1 0, 1 2 2, 0 3 1].
The weights for the output layer node from the respective hidden layer nodes are [-1 1 2].
The bias for hidden layer nodes are [0 0 -1] and bias for output layer node is [-1]. Consider the learning rate as 0.3 and target as 0.9.

Q-4 **[5]**



Gridworld MDP



Transition function

This gridworld MDP operates like the 4 X 3 world environment.
State:
The states are grid squares, identified by their row and column number (row first). The agent always starts in state (1,1), marked with the letter S.
Reward:
There are two terminal goal states, (2,3) with reward +5 and (1,3) with reward -5. Rewards are 0 in non-terminal states. (The reward for a state is received as the agent moves into the state.)
Transition:
The transition function is such that the intended agent movement (North, South, West, or East) happens with probability .8. With probability .1 each, the agent ends up in one of the states perpendicular to the intended direction. If a collision with a wall happens, the agent stays in the same state.
Action:
Agents can take action Left, Right, Bottom, Top.
Question:

1. Design the optimal policy for this grid with all States (S) and Optimal Policy $\pi*(S)$ for those all states in tabular form?
2. Draw GridWorld MDP with optimal Policy Actions with arrows.

Q-5 A Genetic Algorithm uses chromosomes of the form x=abcdefgh with a fixed length of eight genes. Here a, b, c, d, e, f, g, h are genes of chromosomes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: **[5]**

$$f(x) = (a+b)+(c+d)-(e+f)-(g+h)$$

and initial population consists of four individuals with the following chromosomes:

x1 = 57126541
x2 = 23926601
x3 = 35321215
x4 = 71052904

Give the answer of following questions:
(i) Write down the Sorting order of Chromosomes according to fitness value in descending order (from high fittest value to least fit value).
(ii) Perform uniform crossover at positions a, d and f of parents on the following pair:

x1 & x4 will generate offspring O1 & O2
x2 & x3 will generate offspring O3 & O4

(iii) Perform inversion mutation on generated offspring from above question at starting position d and ending position h.
(iv) The new population consists of the four offspring individuals received by the above question. Evaluate the fitness of the new population. Has the overall fitness improved?
(v) After observing Q. i to iv, which steps of Genetic algorithm are not included in above Q. i to iv?

Q-6 **[5]**

1. Aman likes all kinds of food.
2. Bananas are food.
3. Anything anyone eats and isn't killed by is food.
4. Anurag eats peanuts and is still alive.
5. Bipin eats everything Anurag eats.

Now, attempt following:
i. Translate above sentences into formulas in first order predicate logic.
ii. Translate predicate logic into CNF.
iii. Use resolution to answer the question, "What food does Bipin eat?"
iv. Draw a Resolution Tree to answer the question, "What food does Bipin eat?"

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