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Paper Code : MCAN-302 Artificial Intelligence

UPID : 003880

Time Allotted : 3 Hours   *Full Marks :70*

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer *any ten* of the following :   [1 x 10 = 10]

    (I) Represent the following statement in FOPL:
    Anyone who has any cats will not have any mice.

    (II) What is the run time complexity of BFS?

    (III) In Minimax search, what is the name of the first player?

    (IV) What is meant by probability density function?

    (V) Give an example of medical expert system.

    (VI) Name some data types in Prolog.

    (VII) What is tautology? Explain with an example?

    (VIII) Give any two heuristic estimates for 8 puzzle problem.

    (IX) What is the other name of backward state-space search?

    (X) How many terms are required for building a Bayesian model?

    (XI) What is the limitation of Waltz algorithm?

    (XII) Mention any two features of Prolog language.

Group-B (Short Answer Type Question)

Answer *any three* of the following :   [5 x 3 = 15]

2. What is heuristic? Give Euclidean distance and Manhattan distance heuristic estimates for 8 puzzle   [5]
problem for the following start and goal configurations.

1	2	3
4	5	6
7		8

Start Configuration

1	5	3
4		6
7	2	8

Goal Configuration

3. Prove that (((P -->Q) -->P) -->P) is a tautology. How a tautology differs from a contradiction?   3+2   [5]

4. What are the four parts of fuzzy logic? Explain with a block diagram.   [5]

5. What do you mean by Natural Language Processing (NLP)? What is parsing in NLP? What are the types of   [5]
parsing? Draw the parsed tree of the sentence "The white dog crossed the road".

6. Briefly describe the disadvantages of basic Hill Climbing Algorithm.   [5]

Group-C (Long Answer Type Question)

Answer *any three* of the following :   [15 x 3 = 45]

7. a) Describe the step-by-step procedure for resolution theorem i.e., steps to convert to clausal form. [6+4+5]
b) Convert ((A-->B) -->C) into CNF.
c)Given the following initial and the goal state for the Block's world problem. Construct a set of operators (rules) and hence generate a plan to reach the goal state from initial state.
Initial state: On(C,A), Clear(C), On(B,table), Clear(B)
Goal state: On(B,A), On(C,B)

8. a) What are the components of a Constraints Satisfaction Problem? [2+4+5+4]
b) State 8 queen problem as a Constraint Satisfaction Problem.
c) Give a solution of 8 queen problem as stated in part (b).
d) Give a clear block diagram of an expert system shell. Clearly mention the utility of all of its components.

9. a) Critically compare DFS and BFS algorithms. [3+4+8]
b) What do you mean by admissible heuristic? Explain with a suitable example.
c) Consider the following arrangement of 8 puzzle and solve the problem using A* search. Define the State space, write the operations, define the heuristic and also find whether this heuristic is admissible or not. Also show the solution.
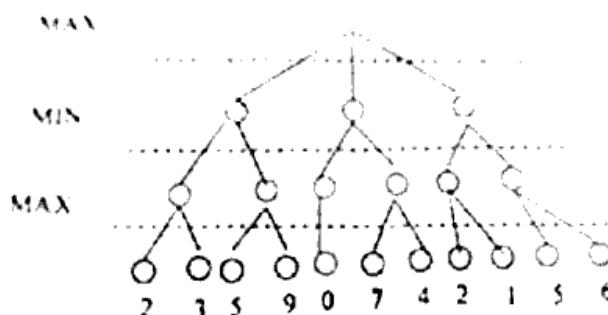Initial State:
2 8 3
1 6 4
7 5
Final State:
1 2 3
8 4
7 6 5

10. a) Consider the following game tree. [4+4+7]

i) Using MINIMAX procedure, determine what moves should be chosen by the maximizer in his first turn.
ii) Execute Alpla-Beta pruning on the above game tree. How many terminal nodes are examined? For each cutoff specify whether it is an Alpha-cutoff or Beta cutoff. https://www.makaut.com
b) Convert the following sentence in FOPL in clauses. Clearly mention each step.

$\forall X ((Child (X) \wedge \exists Y (Takes (X, Y) \wedge Biscuit (Y))) \rightarrow Loves (john, X)$

11. a) Write a prolog program to find whether a number is palindrome or not. [5+5+5]
b) Write a program in prolog to print nth Fibonacci number.
c) What are rules and facts in Prolog?

*** END OF PAPER ***