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Paper Code : CS-703C

ARTIFICIAL INTELLIGENCE

Time Allotted : 3 Hours   Full Marks : 70

The figures in the margin indicate full marks.

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

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following :

$10 \times 1 = 10$

i) What is meant by simulated annealing in artificial intelligence ?

a) Returns an optimal solution when there is a proper cooling schedule

b) Returns an optimal solution when there is no proper cooling schedule

c) It will not return an optimal solution when there is a proper cooling schedule

d) None of the mentioned.

ii) A* algorithm is based on

a) Breadth-first-search

b) Depth-first-search

c) Best-first-search

d) Hill climbing.

iii) Which search agent operates by interleaving computation and action ?

a) Offline search   b) Online search

c) Breadth-first search d) Depth-first search.

iv) How the new states are generated in genetic algorithm ?

a) Composition   b) Mutation

c) Cross-over   d) Both (b) and (c).

v) Which search method takes less memory ?

a) Depth-First Search   b) Breadth-First search

c) Both (a) and (b)   d) Linear Search.

vi) How do you represent "all dogs have tails" ?

a) $\forall_x : dog(x) \rightarrow has\ tail\ (x)$

b) $\forall_x : dog(x) \rightarrow has\ tail\ (y)$

c) $\forall_x : dog(y) \rightarrow has\ tail\ (x)$

d) $\forall_x : dog(x) \rightarrow has \rightarrow tail\ (x)$.

vii) Which condition is used to cease the growth of forward chaining ?

    a)   Atomic sentences

    b)   Complex sentences

    c)   No further inference

    d)   All of the mentioned.

viii) Which is the most straight forward approach for planning algorithm ?

    a)   Best-first search

    b)   State-space search

    c)   Depth-first search

    d)   Hill-climbing search.

ix) Fuzzy logic is a form of

    a)   Two-valued logic   b)   Crisp set logic

    c)   Many-valued logic   d)   Binary set logic.

x) The truth values of traditional set theory is .... and that fuzzy set is ....

    a)   Either 0 or 1, between 0 & 1

    b)   Between 0 and 1, either 0 or 1

    c)   Between 0 and 1, between 0 and 1

    d)   Either 0 or 1, either 0 or 1.

GROUP – B
(Short Answer Type Questions)
Answer any *three* of the following.   3 × 5 = 15

2.   What do you mean by contradiction and contingency ? Explain semantic network with proper example.   3 + 2

3.   What is an agent ? Describe various agent types.   2 + 3

4.   A problem solving search can proceed either in the forward or the backward direction. Justify.

5.   Write a prolog program to find out the Factorial of a number.

6.   Distinguish between Declarative and Procedural Knowledge. What is a production system ?   4 + 1

GROUP – C
(Long Answer Type Questions)
Answer any *three* of the following.   3 × 15 = 45

7.   a)   What do you mean by consistency of a heuristic ?

    b)   Compare Hill climbing and Best First search.

c) Consider the following arrangement 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

$2 + 3 + 10$

8. By using the predicate logic principles prove that "Marcus hated Caeser". Given below are the list of statements.

Marcus was a man.

Marcus was Pompeian.

All Pompeians were Romans.

Caeser was a ruler.

All Romans were either loyal to Caeser or hated him.

Everyone is loyal to someone.

People only try to assassinate rulers they are not loyal to.

Marcus tried to assassinate Caeser.

Explain the answer thoroughly.

9. a) What is percept sequence ?

b) What is agent system ?

c) Write down the advantages and disadvantages of Genetic Algorithm.

d) Briefly discuss combinatorial explosion.

$3 + 3 + 4 + 5$

10. a) When does BFS give optimal solution ?

b) What are the three major problems of hill-climbing technique ?

c) You are given two jugs, a 4-gallon one and a 3-gallon one. Neither have any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallon jug ? Give the state-space diagram, describe the production rules and give a possible solution. $2 + 3 + 10$

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11. a)   What is a tautology ? Explain with an example.

     b)   Write the predicate logic representations for the following sentences :

        (i)   If it is bird, it can fly

        (ii)   Every father is parent

        (iii)   Every man has beatenp the thief

        (iv)   Every person in the party loves every child.

     c)   What is horn clause ? Show that $p \to q$ is a horn clause. $3 + (2 + 2 + 2 + 2) + 4$