MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : IT-605D

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) Inheritable knowledge is best represented by

a) Semantic net b) SOPL

c) Database d) none of these.

ii) Decomposable problem can be represented by

a) OR graph b) AND graph

c) AND-OR graph d) none of these.

iii) According to MOUS PONENS INFERENCE rule from P and $P \rightarrow Q$ infer

a) P b) Q

c) $\overline{P}$ d) $\overline{Q}$.

iv) If in a problem the number of initial state is much more than the number of final state. We should use

a) forward reasoning

b) backward reasoning

c) both (a) and (b)

d) none of these.

v) A Baysian network is a

a) Tree b) Directed graph

c) Undirected graph d) none of these.

vi) Dependency directed bracktracking is

a) Better b) Always better

c) Can't be said d) none of these.

vii) Time complexity of BFS is

a) $O(b^d)$ b) e^d

c) e^b d) $O(d^b)$.

viii) The space complexity of DFS is

a) $O(d)$ b) $O(b)$

c) $O(b^d)$ d) $O(d^b)$.

ix) Which of the following algorithms does not face local maxima problem ?

a) Simple hill climbing

b) Steepest ascent hill climbing.

c) Best first

d) None of these.

x) Which is not heuristic search ?

a) Hill climbing

b) Simulated annealing

c) Constraint Satisfaction Search

d) Best first search.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Define the term 'production system'. Discuss the benefits of production system.

3. a) How does forward reasoning differ from forward reasoning ? Explain with suitable example.

   b) Explain Turing test method for an intelligent system. 3 + 2

4. "A game tree is basically an AND-OR graph." Justify the statement.

5. Write PROLOG/LISP program to perform GCD.

6. What is the hill climbing technique ? Describe it.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. A game tree is having branching factor 2 and depth 4 with maximizing player at root level. The leaf node values are 2, 1, 4, 10, 16, 22, 30, 5, 6, 33, 20, 11, 2, 15, 19. Apply $\alpha - \beta$ cutoff search technique to find the value at root. Also identify different cut-offs and their patterns.

8. The missionary and unbelievers problems have 3 missionary and 3 unbelievers stand at the leftbank of the river. They wish to cross the river. There is a small boat (without boatman) to ferry them across but it holds atmost 2 persons. Whenever there are more missionary that unbelievers on either bank of the river the missionary will convert the unbeliever. The problem is to find whether there is any possible sequence of ferryings for the 6 persons to cross the river without any of the unbelievers getting converted.

   a) Formulate the problem as a state search problem.

   b) Draw the implicit search graph.

9. a) Represent the following using predicate logic and draw the conclusion.

      i) Amal is an Indian.

      ii) Bimal is an Indian.

      iii) Amal is a leader.

      iv) Every Indian is a man.

      v) Every man is either likes a leader or dislikes a leader.

   b) What are the advantages of predicate logic over propositional logic ?

   c) Prove that :

      i) Algorithm 'U' terminates successfully.

      ii) If heuristic is consistent then that is admissible but the opposite is not true.

   6 + 1 + (4 + 4)

10. a) What is expert system ? Why is it required ?

   b) Given the following initial and 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)

   c) What is CSP ? Formulate 4 queens problem as a CSP. 3 + 5 +7

11. Write short notes on any *three* of the following: 3×5

a) Local maxima & Global maxima

b) State space representation

c) Semantic net

d) Dempster-Shaft theory

e) Minimax Search Procedure.