Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (CSE)/SEM-7/CS-702/2010-11

2010-11
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) An algorithm that gives optimal solution is

   a) Hill Climbing b) BFS

   c) Blind search d) A*.

   ii) A formula with no free variables is

   a) formula b) clause

   c) a sentence d) paragraph.

   iii) In First Order logic, resolution condenses the ..... of logical inference down to a single rule.

   a) Traditional syllogism b) Logical sequence

   c) Logical reference d) None of these.

iv) Uninformed search is also known as

a) Brute force search b) Hill climbing search

c) Worst case search d) Blind search.

v) Horn clause is a clause with ..... positive literals.

a) At most one b) At most two

c) At least one d) At most four.

vi) Which of the following is a declarative knowledge ?

a) A set of production rules

b) Using LISP code to define a value

c) Describing the objects using a set of attributes and associated values

d) A knowledge about the order in which to pursue the subgoals.

vii) Which of the following is *not* true about backward chaining ?

a) Backward chaining is a goal directed reasoning process

b) Backward chaining would be much better to use when trying to prove theorems

c) For arriving at a new fact, backward chaining is more natural

d) A medical diagnostic program is a query system that would probably use.

viii) "John is tall". This statement can be completely expressed in

a) FOPL

b) Propositional logic

c) Fuzzy logic

d) Default logic.

ix) Which is not heuristic search ?

a) Constrained satisfaction search

b) Depth first search

c) Simulated annealing

d) Steepest ascent Hill climbing.

x) Resolution can be used for

a) question answering b) theorem proving

c) both (a) and (b) d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. A problem-solving search can proceed in either the forward or the backward direction. What factors determine the choice of direction for a particular problem ?

3. With suitable example explain the characteristics of monotonic and partially commutative production system.

4. Give one example of a problem in which solutions requiring minimum search are more appropriate than optimal solutions. Give reasons for your choices.

5. Discuss the benefits of production system.

6. Write a program in prolog to compute the factorial of a number using iteration/tail recursion.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. Prove each of the following statements :

   a) Breadth first search is a special case of uniform cost search. 5

   b) Breadth first, depth first and uniform cost search are special cases of Best First Search. 5

   c) Uniform cost search is a special case of A* search. 5

8. a) Represent the following sentences by default logic. Also mention the sets *D* and *W*.

      i) Typically molluscs are shell-bearers

      ii) Cephalopods are molluscs

      iii) Cephalopods are not shell-bearers. 6

   b) Draw a decision tree corresponding to the following expression :

      If (Weather = Hot ∧ Humidity = High) ∨ (Weather = Cool ∧ Humidity = Moderate) ∨ (Weather = Rainy ∧ Wind = Strong).

      Then start reading a story book. 9

9. a) Using the Euclidean distance of a node (x, y) from a fixed node (2, 2), i.e., $h = \left[(x-2)^2+(y-2)^2\right]^{\frac{1}{2}}$ solve the water-jug problem by A* algorithm. Does this heuristic function return an optimal path ? Consequently, can you call it an admissible heuristic ? 8

   b) Show the computation for the first 3 ply moves in a tic-tac-toe game using the α-β cut-off algorithm. 7

10. Test whether the following production systems are commutative. Justify your answer.

   a) Knowledge base :

   If A & B then C

   If C then D

   If A & D then E.

   Initial Working Memory = { A, B }

   Knowledge base :

   If A & B then C

   If X & Y then C

   If A then E

   If B then F.

   Initial WM = { A, B, X, Y }. 8

b) Give 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 the initial state.

Initial State : On (*C*, *A*)

Clear (*C*),

On (*B*, Table),

Clear (*B*).

Goal State : On (*B*, *A*)

On (*C*, *B*). 7