

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.

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- 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.

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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.

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GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

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.

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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 \wedge Humidity = High) \vee
(Weather = Cool \wedge Humidity = Moderate) \vee
(Weather = Rainy \wedge Wind = Strong).
- Then start reading a story book. 9

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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 }.

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- 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).

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