



Name :
Roll No. :
Invigilator's Signature :

CS / MCA / SEM-3 / MCA-303 / 2010-11

2010-11

INTELLIGENT SYSTEMS

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 any *ten* of the following :

10 × 1 = 10

i) The forward reasoning in problems are generally represented by

- a) Semantic net
- b) FOPL
- c) Frame
- d) None of these.

ii) Which of the following is a tautology ?

- a) $p \vee q \rightarrow p$
- b) $p \wedge q \rightarrow p$
- c) $p \rightarrow q$
- d) None of these.



iii) A zero place function symbol is a

- a) constant
- b) variable
- c) proposition
- d) none of these.

iv) Epistemology is

- a) study of nature of knowledge
- b) knowledge about knowledge
- c) hypothesis
- d) none of these.

v) Which is not pure AI game ?

- a) Ludo
- b) Snakes and ladder
- c) Tic-tac-toe
- d) Chess.

vi) What is not a heuristic search ?

- a) A* search
- b) AO* search
- c) Breadth first search
- d) Best first search.



vii) Which one is a blind search ?

- a) DFS
- b) A* search
- c) Best First search
- d) AO* search.

viii) The time complexity of breadth first search is

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

ix) A Bayesian network is a

- a) tree
- b) directed graph
- c) non-directed graph
- d) none of these.

x) Simulated annealing is a variation of

- a) Hill climbing
- b) BFS
- c) Heuristic search
- d) Constraint satisfaction.



- xi) Frame is a collection of
- a) Slots
 - b) Filler
 - c) Resolution
 - d) Knowledge.

GROUP – B

(Short Answer Type Questions)

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

2. Compare DFS and BFS algorithms in respect of their advantages and disadvantages. Why is Iterative deepening search needed ?
3. Differentiate between the following :
 - a) Inheritable knowledge and inferential knowledge
 - b) Procedural and declarative knowledge.
4. State Modus Ponens rule using example. Differentiate Forward and Backward reasoning with example.
5. Convert the following wff's into Horn Clause :
 - i) $\forall x : \forall y : \text{cat}(x) \wedge \text{fish}(y) \rightarrow \text{likes-to-eat}(x, y)$
 - ii) $\forall x : \text{calico}(x) \rightarrow \text{cat}(x)$
 - iii) $\forall x : \text{tuna}(x) \rightarrow \text{fish}(x)$.



6. Convert the sentences into FOPL sentences :

- i) Every dog is an animal
- ii) Every dog likes to eat meat
- iii) No dog gets vegetables
- iv) Jam is a dog
- v) All of the dogs hate cats.

GROUP – C

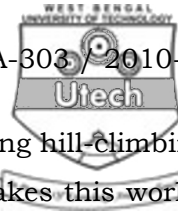
(Long Answer Type Questions)

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

- 7. a) What is the hill climbing technique ? Describe it. 5 + 3
- b) Given two jugs with no measuring marker– a 4 gallon jug and a 3 gallon jug. There is a pump to fill the jug with water. How do you get exactly 2 gallons of water in the 4 gallon jug ? Indicate state space for the problem. Describe the production rules and give a possible solution. 5
- c) What is the difference between hill climbing and best-first technique ? 2



8. a) What do you mean by admissibility and consistency of a heuristic function ? 3
- b) Validate each of the following statements giving brief explanation :
- i) The heuristic function “sum of Manhattan distances” for 8-puzzle problem is consistent.
- ii) If heuristic is consistent then the heuristic is admissible but the converse is not true. 4 + 3
- c) Write a prolog program to find the sum of first N natural numbers. 5
9. a) The game of NIM is played as follows :
- Two players alternate in removing one, two or three coins from a stack initially containing five coins. Two players who pick up the last coin lose.
- i) Draw the full game tree
- ii) Show that the player who has the second move can always win. 7 + 3
- b) How does $\alpha - \beta$ pruning procedure improve search procedure ? 5



10. a) Consider trying to solve the 8-puzzle using hill-climbing. Can you find Heuristic function that makes this work ? Make sure it works on the following example :

Start

1	2	3
8	5	6
4	7	

Goal

1	2	3
4	5	6
7	8	

- b) Is the Minimax procedure a DFS or BFS procedure ?
11. a) Under which condition A* algorithm provides an optimal solution ?
- b) Justify the statement “A game tree is basically an AND/OR graph”.
- c) Discuss the state space search.

=====