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 :

$10 \times 1 = 10$

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 Baysian 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 × 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 Ponen rule using example. Differentiate Forward and Backward reasoning with example.

5. Convert the following wff's into Horn Clause :

   i) $\forall x : \forall y : \text{cat}(x) \wedge \text{fish}(y) \rightarrow \text{likes} - \text{to} - \text{eat}(x, y)$

   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.

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