Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MCA/SEM-3/MCA-303/2009-10

2009
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 the following : $10 \times 1 = 10$

   i) Inheritable knowledge is best represented by

   a) Semantic net b) FOPL

   c) Frame d) None of these.

   ii) The forward reasoning in problems are generally represented by

   a) OR graph b) AND graph

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

   iii) Which of the following is tautology ?

   a) $p \vee q \rightarrow p$ b) $p \wedge q \rightarrow p$

   c) $p \rightarrow q$ d) none of these.

iv) What is the heuristic search ?

a) Depth first search b) Breadth first search

c) Breast first search d) None of these.

v) A formula is valid

a) if it is tautology

b) if it is inconsistent

c) if there exists one counter model

d) none of these.

vi) A zero place function symbol is a

a) constant b) variable

c) proposition d) none of these.

vii) Which is not symbolic logic ?

a) Modal logic b) Temporal logic

c) Intuitionistic logic d) All of these.

viii) Epistemology is

a) study of nature of knowledge

b) knowledge about knowledge

c) hypothesis

d) none of these.

ix) Which is not a pure AI game ?

a) Ludo b) Snakes and Ladders

c) Tic-tac-toe d) Chess.

x) A Bayesian network is a

a) tree b) directed graph

c) non-directed graph d) none of these.

GROUP – B
(Short Answer Type Questions)

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

2. Compare the depth-first search and breadth-first search algorithms by writing out their advantages and disadvantages.

3. A game tree is basically an AND/OR graph. Justify the statement. Define a state space.

4. Differentiate between the following : $2\frac{1}{2} + 2\frac{1}{2}$

a) Inheritable knowledge and inferential knowledge

b) Procedural knowledge and declarative knowledge.

5. Draw a semantic net for the sentence “Every dog has bitten a mail carrier”.

6. Convert the following English statements to statements in first order logic :

   a) Every boy or girl is a child

   b) Every child gets a doll or a train or a lump of coal

   c) No boy gets any doll

   d) No child who is good gets any lump of coal

   e) Jack is a boy. 5

GROUP – C
(Long Answer Type Questions)

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

7. a) Give predicate logic statements to describe the following :

      i) The boy is either mad or a fool

      ii) No one likes durian

      iii) Computers can never be intelligent

      iv) Children hate all those who hate animals.

   b) Consider the following knowledge base :

      i) The-humidity-is-high or the-sky-is-cloudy

      ii) If the-sky-is cloudy then it-will-rain

      iii) If the-humidity-is-high then it-is-hot

      iv) It-will-not-rain

      and the goal : it-is-hot

      Prove by resolution theorem that the goal is derivable from the knowledge base. 8 + 7

8. a) Animals can be divided into various categories such as mammals and birds. Mammals have hair. They give milk too. Birds can fly and lay eggs. Animals who eat meat, are known as carnivore. These carnivore animals have pointed teeth, claws and forward eyes. Mammals who have hoofs or chew cud are known as ungulate. Cheetah is a mammal as well as a carnivore. It has tawny colour and dark spots. Giraffe is an ungulate. It has a long neck, long legs and dark spots. Zebra is also an ungulate with black stripes. Although a Penguin is a bird, it cannot fly, but it can swim. It is coloured black and white.

Represent the above information using a semantic network.

b) Briefly describe how the fact that "a penguin is a bird that cannot fly" can be represented in the above knowledge representation scheme. 12 + 3

9. a) What are the different approaches in defining artificial intelligence ?

b) Suppose you have the following search space :

State	Next	Cost
A	B	4
A	C	1
B	D	3
B	E	8
C	C	0
C	D	2
C	F	6
D	C	2
D	E	4
E	G	2
F	G	8

i) Draw the state space of this problem.

ii) Assume that the initial state is **A** and the goal state is **G**. Show how each of the following search strategies would create a search tree to find a path from the initial state to the goal state :

- breadth-first search
- depth-first search
- uniform cost search.

At each step of the search algorithm, show which node is being expanded, and the content of fringe. Also report the eventual solution found by each algorithm, and the solution cost.

3 + 3 + (3 + 3 + 3)

10. a) When is a heuristic consistent ? Prove that "if a heuristic H is a consistent, the f values along any path will be non-decreasing".

b) Consider the Game of Tic-tac-toe. Starting from the board position below, expand the complete game tree and calculate the value of each board position.

O	O	×
	×	
O	×	

c) Prove the Admissibility & Completeness of A^*.

(2+3)+5+5

11. a) What are the characteristic features of Expert System ? Why is it important that an expert system be able to explain the why and how questions related to a problem solving session ?

b) What do you mean by adversial search problem ? Briefly explain minimax algorithm using two player game tree.

8 + 7