ROLL NO. _____

Code: CT71 **Subject: ARTIFICIAL INTELLIGENCE**

ALCCS – NEW SCHEME

Time: 3 Hours **AUGUST 2013** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:

- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**

Q.1 a. What can AI systems not do yet? List any four tasks.

b. List some of the characteristics of percept-based agents.

c. What is the search cost associated with the time and memory required to find a solution?

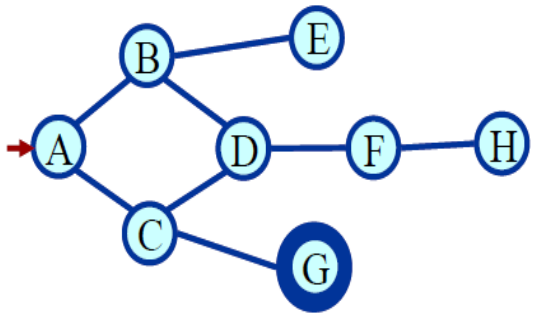
d. What are two main difficulties with the gradient descent method? How these can be handled?

e. Construct semantic network representations for the information below.
Mary gave the green flowered vase to her cousin.

f. Compare the following two terms associated with a knowledge representation system- Inferential Adequacy, Inferential Efficiency.

g. How are the defaults handled in frames? Explain using an example. **(7×4)**

Q.2 a. Consider the following graph.



Starting from state A, execute DFS. The goal node is G. Show the order in which the nodes are expanded. Assume that the alphabetically smaller node is expanded first to break ties. **(6)**

b. What do you mean by Alpha-Beta pruning? On what factor the efficiency of the Alpha-Beta procedure depends? **(4)**

c. Consider the game of tic-tac-toe. Assume that X is the MAX player. Let the utility of a win for X be 10, a loss for X be -10 and a draw be 0. Given the game board board1 below where it is X's turn to play next, show the entire game tree. Mark the utilities of each terminal state and use the minimax algorithm to calculate the optimal move.**(8)**

board1

X	O	X
O		O
	X	

Q.3 a. Consider the following set of axioms
(i) Everyone who loves someone who loves them back is happy
(ii) Mary loves everyone
(iii) There is someone who loves Mary
From the above statements conclude that: Mary is happy. **(10)**

b. Using propositional logic prove (D) from (A, B, C): **(8)**
(A) $P \Rightarrow (Q \Leftrightarrow R)$
(B) $\neg(Q \Leftrightarrow R)$
(C) $(S \wedge Q) \Rightarrow P$
(D) $\neg P \wedge (S \Rightarrow \neg Q)$

Q.4 a. Write a PROLOG programs to append two lists. Show dry-run of your program using a suitable example. **(8)**

b. Given the following initial and the goal state for the Blocks world problem. Construct a set of operators (Rules) and hence generate a plan to reach the goal state from the initial state.
Initial state: ontable(A) Λ ontable(B) Λ on(C, B) Λ clear(A)
Goal State: ontable(B) Λ on(C, B) Λ on(A, C) Λ clear(A)
Where ontable(x): block *x* is on top of the table
on(x,y): block *x* is on top of block *y*
clear(x): there is nothing on top of block *x*; therefore it can be picked up
handempty: you are not holding any block **(10)**

Q.5 a. What is an expert system? Briefly describe five major components of an expert system. Using a suitable query, explain the working of an inference engine in a rule-based expert system. **(1+5+4)**

b. Let X = {0, 1, 2, …., 6}, and let two fuzzy subsets, A and B, of X be defined by:

x	0	1	2	3	4	5	6
$\mu_A(x)$	1	0,7	0	1	0,5	0	0,4
$\mu_B(x)$	0,9	0,7	1	0,2	0,8	0,3	0

Find: $A \cap B, A \cup B, \overline{A}\,\overline{B}$ **(8)**

Q.6 a. Using suitable examples, define following three types of encoding used in genetic algorithm: Binary, Permutation and Value and Tree encoding. **(8)**

b. Consider an Internet shopping agent and answer the following:
(i) What are the percepts for this agent?
(ii) Characterize the operating environment.
(iii) What are the actions the agent can take?
(iv) How can one evaluate the performance of the agent?
(v) What sort of agent architecture do you think is most suitable for this agent? **(10)**

Q.7 a. Briefly explain the role of CFG in Natural Language Processing. Give a suitable example to explain the concept. **(8)**

b. Write brief notes on any **TWO** of the following:

(i) Multi-layered Perceptron (MLP)
(ii) Reinforcement learning
(iii) Neuro-fuzzy systems **(10)**