2011

4th SEMESTER EXAMINATION

MCA

ARTIFICIAL INTELLIGENCE & EXPERT SYSTEM

PAPER—CS/MCA/2402

Full Marks : 70

Time : 3 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Answer Q. No. *1* and any *four* questions.

1. Consider Travelling Salesman problem for 5 cities :

(i) Formulate the problem as state space search problem.

(ii) Construct the state space search graph.

(iii) Apply DFS on the graph.

2+3+5

2. (i) Is the implication $(P \wedge (P \Rightarrow \sim Q)) \vee (Q \Rightarrow \sim Q) \Rightarrow \sim Q$ a tautology ?

(ii) Find the principal disjunctive normal form of

$$P \Rightarrow (P \Rightarrow Q \wedge (\sim (\sim Q \vee \sim P)))$$

(iii) Define with example — Universal Quantifier and Existential Quantifier. 6+6+3

3. (i) Write a Prolog Program to calculate the sum of N natural numbers, where N should be inputed through the program.

(ii) Test the validity of the following argument —

If milk is black then every crow is white. If every crow is white then it has four legs. If every crow has four legs then every buffalo is white and brisk. The milk is black. Therefore, the buffalo is white.

7+8

4. Consider a sliding block puzzle with the following initial configuration.

W	W	W	B	B	B	E

There are three white files (W), three black files (B) and an empty cell (E). The puzzle has the following moves.

(a) A file may move into an adjacent empty cell with unit cost.

(b) A file may hop over at most two other files into an empty cell with a cost equal to the number of files hopped over.

The goal of the puzzle is to have all of the black tiles to the left of all of the white tiles (without regard for the position of the empty cell).

(i) Find the sequence of moves that will transform the initial configuration to a goal configuration. What is the cost of the solution ?

(ii) Specify a heuristic function 'h' for this problem and show the search tree (a part of it) produced by A* using this heuristic function. Is your heuristic admissible ?

5+10

5. 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. The players who picks up the last coin loses.

(a) Draw the full game tree.

(b) Show that the player who has the 2nd move always win.

(c) Execute α-β pruning procedure on the game tree. How many terminal nodes are examined .

4+5+6

6. (i) Show that the algorithm—'uniform cost' terminates successfully and outputs optimal cost path.

(ii) Prove that the heuristic 'sum of manhattan distances' for the eight puzzle problem is an admissible heuristic.

(iii) Prove that U never expands a node more than once. Is it true for algorithm A*? Justify your answer.

5+5+5
