2017

MCA

5th Semester Examination

ARTIFICIAL INTELLIGENCE

PAPER—MCA 503

Subject Code—32

Full Marks : 100

Time : 3 Hours

The figures in the right hand 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 any *five* questions. 5×14

1. (a) Prove the following equivalences using truth table :

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

$P \leftrightarrow Q \equiv (P \rightarrow Q) \wedge (Q \rightarrow P)$

(b) Define Existential Quantifiers and Universal Quantifiers with example.

(c) Explain hill-climbing method.

(d) Show that,

$((p \vee q) \wedge (\sim p \vee r)) \rightarrow (q \vee r)$ is a tautology.

(2+2)+3+3+4

2. (a) Let Loves (x, y) means "x loves y",
Travels (x) means "x is a traveler",
City (x) means "x is a city",
Lives (x, y) means "x lives in y".

Translate the following proposition into the most natural equivalent statement in English. Try to make the sentence as simple and as natural as possible.

$$\exists x \forall y \forall z \ (\text{City}(x) \wedge \text{Traveles}(y) \wedge \text{Lives}(z, x)) \rightarrow (\text{Loves}(y, x) \wedge \neg \text{Loves}(z, x)).$$

(b) Translate the following statements into predicate logic —

(i) No traveler loves the city they live in.

(ii) For everyone there is someone to love.

(iii) All the glitters are not gold. 5+(3+3+3)

3. A farmer with his wolf, goat and cabbage arrives at the bank A of the river they wish to cross. There is a boat at the bank A of river, which the farmer only can row. The boat can carry only things including rows at a time. If the wolf is even left with the goat, the wolf will eat the goat. Also if the goat is left alone with cabbage the goat will each the cabbage.

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

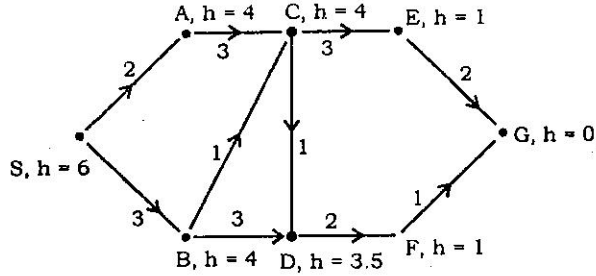
(ii) Solve the problem.

(iii) Draw the implicit search graph.

(iv) Solve this problem using Depth first search algorithm. 3+2+2+7

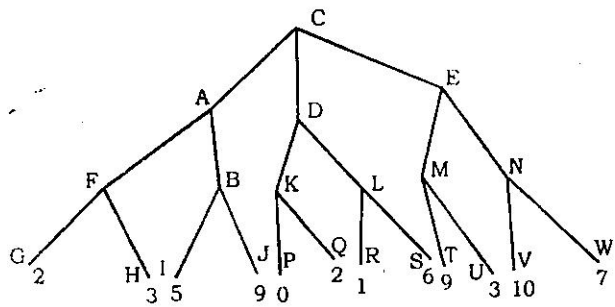
4. (a) *Explain a test which* can identify whether a machine given to you is intelligent. Is there any machine which has qualified this "Intelligence Test" ? Discuss.

(b) Consider the following graph —



Suppose we want to use the A* algorithm on the graph below to find the shortest path form node S to node G. Each node is labelled by a capital letter and the value of a heuristic function. Each edge is labelled by the cost to traverse the edge. 5+9

5. Consider the following tree and apply minimax algorithm to it.



What is the minimax value of C ? 14

6. Write short notes on :

(i) Genetic Algorithm *Or* Table Search.

(ii) Simulated Annealing *Or* Bidirectional Search.

(iii) Iterative deeping algorithm.

Or

(iv) Greedy algorithm. 5+4+5

7. Considering the Tic-Tac-Toe game of two players answer the following questions :

(i) Show the whole game tree starting from an empty board down to depth 2 (i.e., one X and and One O on the board), taking symmetry into account.

(ii) Mark on your tree the evaluations of all the positions at depth 2.

(iii) Using the minimax algorithm, mark on your tree the backed-up values for the positions at depth 1 and 0 and use those values to choose the best starting move.

(iv) Circle the nodes at depth 2 that would not be evaluated if alpha-beta pruning were applied, assuming the nodes are generated in the optimal order for alpha-beta pruning.

3+5+2+4

[Internal Assessment : 30 Marks]