B. TECH

[This question paper contains 7 printed pages]

Your Roll No. : .....

Sl. No. of Q. Paper : **6131** **F-9**

Unique Paper Code : 2341701

Name of the Course : **B.Tech Computer Science**

Name of the Paper : CS–701 Artifical Intelligence

Semester : VII

Time : 3 Hours ***Maximum Marks : 75***

Instructions for Candidates :

(a) Write your Roll No. on the top immediately on receipt of this question paper.

(b) Question No. **1** is compulsory.

(b) Attempt any **four** Question **NO.2 to 7.**

(c) Parts of a question must be answered together.

1. (a) Describe the Turing Test approach to Artifical Intelligence. 3

P.T.O.

(b) What is an agent ? Define a rational agent. 3

(c) Give an example of each of the types 0, 1, 2 and 3 Chomsky's hierarchy of grammars. 4

(d) Define a production system. Which category of production systems may be applicable for a robot navigation problem and why ? 5

(e) Determine which of the following are valid wffs : 4

(i) $((((P \rightarrow Q) \rightarrow \sim R) \leftrightarrow S) \vee (T \wedge U))$

(ii) wife (P(x))

(iii) ~~ P

(iv) PQ →

(f) Convert the following into Clausal Normal Form : 4

$$\forall x\left[B(x) \wedge H(x) \rightarrow W(x) \vee \left[\exists z M(z,x) \wedge \sim \exists z G(z,x)\right]\right]$$

(g) Write prolog programs for the following : 6

(i) Sort a list using insertion sort

(ii) Delete all occurrences of an element in a list

(h) What is the output of the following prolog program and why ? 2

```
car (car 1, black, 450000).
car(car2, silver, 300000).
car(car3, white, 400000).
car(car4, black, 450000).
getcar (Color, Cost_ Less_Than):- car(Name, Color, Cost),!, Cost < Cost_Less_Than, write (Name).
```

The goal is :

```
? getcar (black, 350000).
```

(i) Derive a parse tree for the sentence "Abhinav likes the cake", where the following rewrite rules are used : 4

S → NP VP
NP → N
NP → DET N
VP → V NP
DET → the
V → likes
N → Abhinav | cake

2. (a) Illustrate the operation of the Steepest Ascent Hill Climbing Algorithm using an example. 4

(b) Under what situations can hill climbing fail to find a solution ? 3

(c) Comment on the relevance of h' the estimator of h, in the working of A** algorithm. 3

3. (a) Trace the constraint satisfaction procedure solving the crypt-arithmetic problem : 6

$$\begin{array}{r} TWO \\ +TWO \\ \hline FOUR \end{array}$$

(b) Write a short note on Utility based agents. 4

4. (a) Given the following axioms, prove the conclusion using resolution principle. 7

1. All hounds howl at night.
2. Anyone who has any cats will not have any mice.
3. Light sleepers do not have anything which howls at night.
4. John has either a cat or a hound.
5. (Conclusion) If John is a light sleeper, then John does not have any mice.

(b) Find the most general unifier for 3

(i) t1 = P (f(a), g(X))

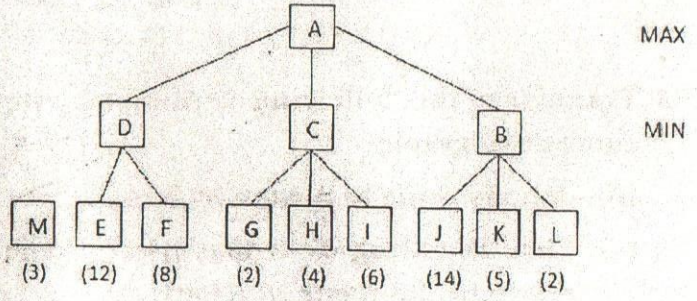
t2 = P (Y, Y)

(ii) t1 = P(f(g(X,a)),X)

t2 = P(f(Y), b)

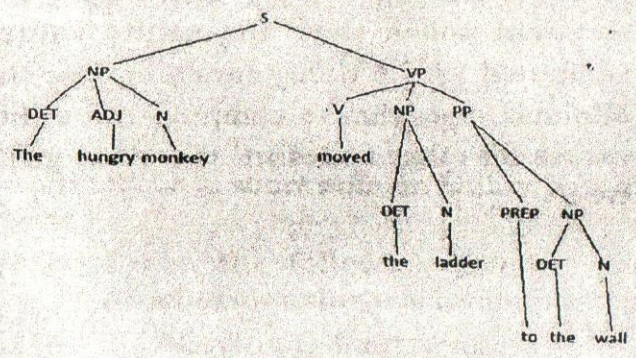
5. (a) Explain the utility of alpha and beta cuts in Minimax problem. 4

(b) In the following two-ply game tree, the terminal nodes show the utility values computed by the utility function. Use the Minimax algorithm to compute the utility values for other nodes in the given game tree. 2



(c) How are frames used for knowledge representation ? Explain using an example. 4

6. (a) Given the following parse tree, draw the Recursive Transition Network for parsing this sentence. Show the traversal of this sentence through the network. 6



(b) Transform the following sentences into conceptual graphs. 4

(i) John is going to Boston by bus.

(ii) Elsie is sitting on a mat (Here, Elsie refers to the name of a cat)

7. (a) Write PDDL statements for the following actions in the Monkey banana problem given the Initial state as : 6

At(Monkey, A) ^ At (Banana, B) ^ At(Box,C) ^ Height (Monkey, Low) ^ Height (Box, Low) ^ Height (Banana, High) ^ Pushable (Box) ^ Climbable (Box)

(i) Go (x,y) : The monkey goes from location x to y.

(ii) Push (b, x, y) : Push a box b from location x to y.

(iii) Climb Down (b) : Monkey climbs down from the box b.

(b) Give the advantages of Breadth first search over Depth First Search. 4