[This question paper contains 8 printed pages]

Your Roll No. : .....

Sl. No. of Q. Paper : **6515** **HC**

Unique Paper Code : 32341601

Name of the Course : **B.Sc.(Hons.) Computer Science**

Name of the Paper : Artificial Intelligence

Semester : VI

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) Section **A** is compulsory.

(c) Attempt any **four** of questions from Section **B**.

(d) Parts of a question must be answerd together.

P.T.O.

SECTION A

1. (a) Describe the following : 4

   i. Agent Function

   ii. Closed World Assumption

   (b) In what type of reasoning existing rules can be retracted ? Explain, whether a rule can be retracted in FOPL. 2

   (c) Let h' denote the estimate of h (the actual cost of getting from the current node to a final state node). Explain in what way the efficiency of A* algorithm and reaching of a goal state is affected if h' always overestimates h. 2

   (d) Differentiate between breadth first search and best first search. 3

   (e) Explain uses of Cut and Fail predicates in PROLOG. 3

   (f) Find the meaning of the statement

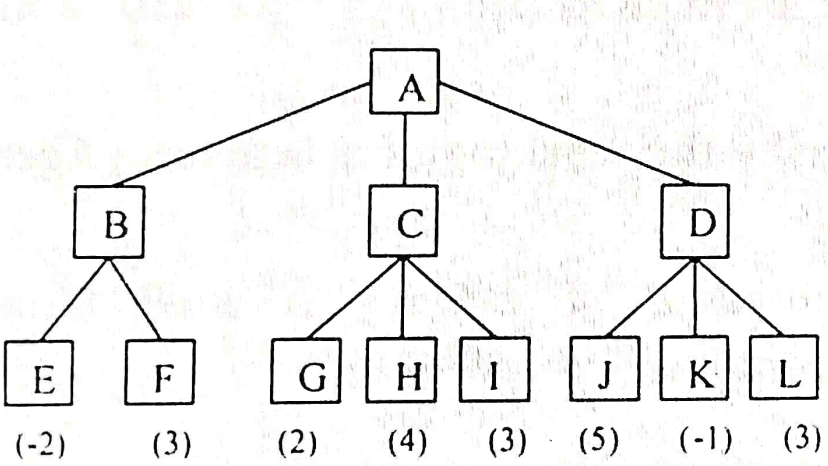
   $(\neg P \vee Q) \& R \rightarrow S \vee (\neg R \vee Q)$ 2

   for the following interpretation : P is true, Q is true, R is false, S is true.

(g) Transform the following sentence into disjunctive normal form : 2

$\neg(P \vee \neg Q) \& (R \rightarrow S)$

(h) Consider the following game tree with ply. depth 2, in which the indicated scores are from the MIN player's point of view. What move should MIN choose, and why ? 3



(i) Express the following sentences as conceptual dependency structures : 4

(i) Bill is a programmer

(ii) Joe gave Sue a flower.

(j) Determine whether set is unifiable ? If yes, obtain a most general unifier. 2

$W = \{P(A,B,B), P(x,y,z)\}$

(k) Differentiate between a fully observable and partially observable environment. 4

(l) Give an example of each of the four types 0, 1, 2 and 3 for Chomsky's hierarchy of grammers. 4

SECTION B

2. (a) Write a PROLOG program to reverse a list. 4

(b) Describe the working of a Learning Agent. 3

(c) Prove that if events A and B are independent, $P(B \mid A) = P(B)$. 3

3. (a) Using constraint satisfaction algorithm, solve the following crypt arithmetic problem. 5

$$\begin{array}{r} \text{O D D} \\ \text{O D D} \\ \hline \text{E V E N} \end{array}$$

(b) Discuss, based on the alpha value of a MAX player and beta value of a MIN player, when the search is discontinued in the MINIMAX procedure using alpha-beta pruning. Explain, using an example. 5

4. (a) Derive a parse tree for the sentence 3

" Mary slept on the chair "

Using the following rules :

S $\rightarrow$ NP VP

NP $\rightarrow$ N

NP $\rightarrow$ DET N

VP $\rightarrow$ V PP

PP $\rightarrow$ PREP NP

N $\rightarrow$ Mary / Chair

V $\rightarrow$ Slept

DET $\rightarrow$ the

PREP $\rightarrow$ on

(b) Joint probability $P(x_1, x_2, \ldots, x_8)$ by inspection as a product of chain conditional probabilities is:

$$P(x_1, x_2, \ldots, x_7) = (P(x_7 | x_5, x_6) P(x_6 | x_3 x_4) P(x_5 | x_4) P(x_4 | x_2) P(x_3 | x_2) P(x_2 | x_1) P(x_1))$$

Draw the causal network for the same. 4

(c) What should be the features of a good performance for a rational agent ? 3

5. (a) Based on the following statements : 7

i. Whoever can read is literate

ii. Dolphins are not literate

iii. Some dolphins are intelligent also.

iv. Donald is a dolphin.

Using resolution to prove that "some intelligent beings cannot read".

(b) Evaluate truth value of expression 3

$$E = \exists X(P(f(x)) \wedge Q(x, f(a)))$$

With given domain D = (1,2); assignment for a=1; assignment for f are : f (1) =2,

f (2) = 1.

6. (a) Write the conceptual graph and FOPL representation for the following sentence : 4

"Every cycle has pedals".

(b) Express the following concepts as an associative network structure with interconnected nodes and labeled arcs.

Company ABC is a software development company. Three departments within the company are Sales, Administration and Programming. Joe is the manager of Programming. Bill and Sue are programmers. Sue is married to Sam. Sam is editor for Prentice Hall. They have three children, and they live on Elm street. Sue wears glasses and is five feet four inches tall. 6

7 . (a) What are the similarities and differences between Conceptual Graph (CG) and Conceptual Dependency (CD) representation structures ? 4

(b) Explain the difference between a Recursive Transition Network and Augmented Transition Network. 3

(c) You are given two jugs of capacity 4-gallon and 3-gallon respectively. Neither has any measuring marker on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallon jug ? Write down solution by showing all intermediate states.

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