(b) Draw the block diagram of learning agent and explain its working.   (5)

[This question paper contains 8 printed pages.]

Your Roll No................

Sr. No. of Question Paper : 4506   **E**

Unique Paper Code   : 32341601

Name of the Paper   : Artificial Intelligence

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

Semester   : VI

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Question **1** is compulsory.

3. Attempt any **four** questions from Question **2** to Question **8**.

4. Parts of a question must be answered together.

1. (a) What do you understand by the term "Rational Agent"?   (2)

     P.T.O.

(b) What would be the output of the following statement in Prolog, and Why? (2)

?- A is 6+3, B = 5+4, A=B.

(c) Construct the truth table for the expression (A & (A V B)). What single term is this expression equal to? (2+1)

(d) Write the joint distribution of x1, x2, x3, x4, x5 and x6 as a product of chain conditional probabilities for the following network : (3)
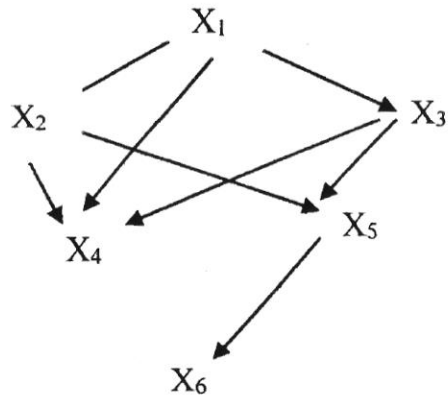
(e) Develop a parse tree for the sentence "Raja slept on the sofa". (2)

(b) Given the following information for a database :

A1. If x is on top of y, y supports x.

A2. If x is above y and they are touching each other, x is on top of y.

A3. A cup is above a book.

A4. A cup is touching a book.

(i) Translate the statements A1 through A4 into clausal form.

(ii) Show that the predicate supports(book, cup) is true using resolution. (4+4)

8. (a) Based on the context free grammar represented by the following parse tree, draw the corresponding Recursive Transition Network (RTN). (5)
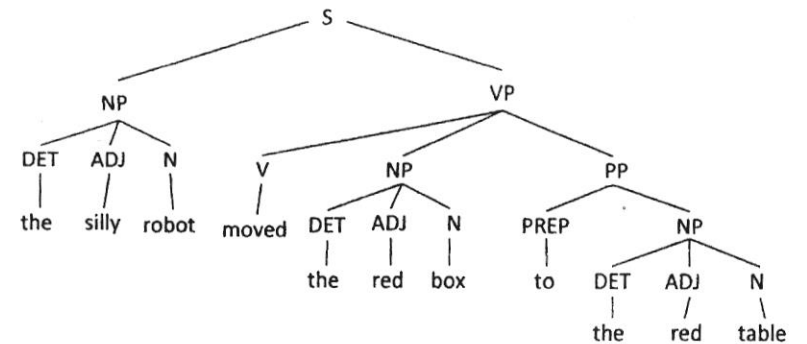
TWO

+ TWO

FOUR

----

6. (a) What is a Truth Maintenance System (TMS)? Give the architecture of a problem solver with a TMS in the form of a diagram. (2+2)

    (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 Programing. Joe is the manager of programming. Bill and Sue are the programmers. Sue is married to Sam. Sam is an editor for the Prentice Hall. They have three children and they live on Elm Street. Sue wears glasses and five feet four inches tall. (6)

7. (a) What is default reasoning? (2)

(f) Compare and contrast Depth first search and Breadth first search? (4)

(g) Transform the following into Conjunctive Normal Form (CNF): (6)

    (i) P V (~P & Q & R)

    (ii) (~P & Q) V (P & ~Q) & S

(h) Express the sentences given below into the conceptual dependency structure: (4)

    (i) Ram drove the car fast.

    (ii) Rita gave Sita a bunch of flowers.

(i) Give the properties of Type 1 and Type 2 grammars from the Chomsky Hierarchy of grammars. (4)

(j) 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)
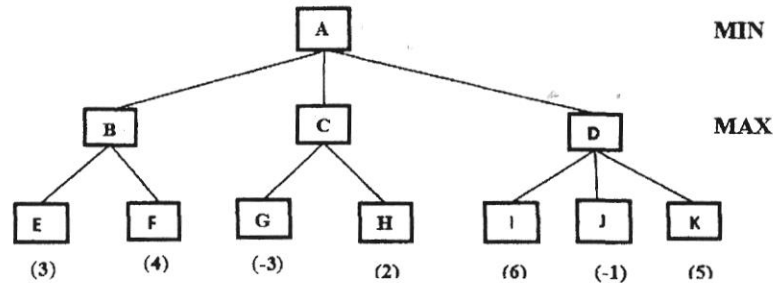
(k) Write about the limitations of Hill Climbing search?   (3)

2   a) Describe the water-jug problem. Also give a suitable state space representation for this problem?   (2+3)

(b) Transform the following into clausal form :   (5)

∃x ∀y (∀z P(f(x), y, z) → (∃u Q (x, u) & ∃v R(y, v)))

3. (a) Write a Prolog program maxlist (L, Max) to find the greatest number Max in the list L.   (5)

(b) Find the probability of the event A when it is known that some event B occurred. From experiments, it has been determined that P(B|A) = 0.84, P(A) = 0.2, and P(B) = 0.34.   (5)

4. (a) Determine whether the following sentence is satisfiable, contradictory or valid :

S : (P V Q) → (P & Q)   (2)

(b) Find whether the following sets are unifiable or not? If they are unifiable, find most general unifier (m.g.u.) otherwise give justification why they are not unifiable.

(i) {S(x, Ram), S(y, Sita)}

(ii) {P(x, y), P (f(x),z), P(z, x)}   (4)

(c) Give PEAS description for Taxi Driver Agent?
                                                (4)

5. (a) When do we say that the search is admissible? You can take the example of A*.   (3)

(b) What is a horn clause? Given an example.   (3)

(c) Solve the following crypt arithmetic problem using constraint satisfaction.   (4)