(Morning)

[This question paper contains 6 printed pages.]

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

**Sr. No. of Question Paper : 2211** **IC**

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. **Section A** is compulsory.
3. Attempt any 4 of questions from **Section B**.
4. Parts of a question must be answered together.

## SECTION A

1. (a) What is a Horn clause? Give an example. (2)

   (b) In the following expression, add parenthesis at appropriate places (as per operators precedence).

   P & Q V ~ R & S → ~ T V X → Y (2)

P.T.O.

(c) How FOPL is better than Propositional logic? (2)

(d) Describe the following terms :

(i) Rationality

(ii) Software Agent (4)

(e) Give the architecture of a problem solver with a Truth Maintenance System. (3)

(f) Write a Prolog program to calculate the length of a given list, L. (4)

(g) Describe the limitations of Hill climbing search. (3)

(h) Define the PEAS for taxi Driver Agent. (3)

(i) Define Heuristic Search technique. What is the role of a heuristic function? (4)

(j) Find whether the following set is unifiable or not? If unifiable, find most general unifier (m.g.u.).

{S(x, Ram), S(y, Sita)} (2)

(k) Give the conceptual dependency representation for the following :

Ram gave Sita for a pencil. (2)



(l) Develop a parse tree for the sentence "Raja slept on the sofa" using the following rules: (4)

S → NP VP

NP → N | DET N

VP → V | PP

PP → PREP NP

N → Raja | sofa

V → slept

DET → the

PREP → on

## SECTION B

2. (a) Define utility based agents and list their benefits. (5)

(b) Elaborate on the additional capabilities of an Augmented Transition Network (ATN as compared to a Recursive Transition Network (RTN). (2)

(c) Draw an associative network for the following sentence :

Tweety is a Yellow bird that has wings and tail. (3)

3. (a) Write a script for watching a movie in a cinema hall. (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. (3)

(c) Determine if the following sentence S is satisfiable, contradictory or valid.

S : $P \rightarrow Q \rightarrow \neg P$ (2)

4. (a) Solve the crypt arithmetic problem :

TWO

+ TWO

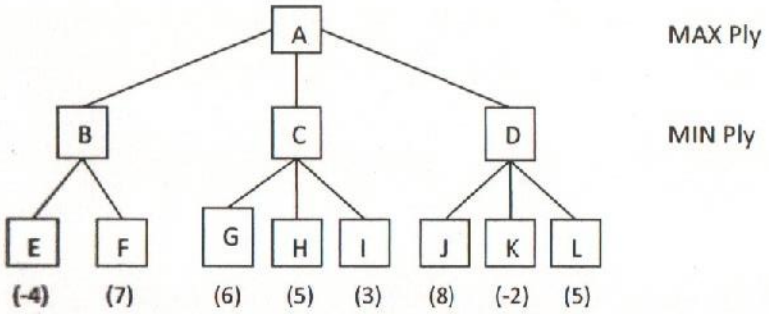
FOUR (4)

(b) Transform the following sentence into CNF :–

$(\neg A \ \& \ B) \ V \ ( A \ \& \ \neg B) \ \& \ C$ (3)

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






5. **(a) What** do you understand by default reasoning in knowledge representation? (2)

**(a)** How a problem is solved using Mean-Ends Analysis. Explain in your own words. (2)

**(c)** 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.

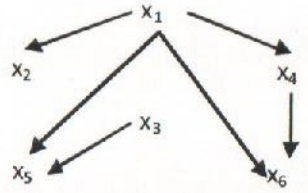
A4. A cup is touching a book.

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

(ii) Show that the predicate supports (book, cup) is true using resolution. (6)

P.T.O.

6. (a) Write the joint distribution of $x_1$, $x_2$, $x_3$, $x_4$, $x_5$, and $x_6$ as a product of the chain conditional probabilities for the following causal network : (3)



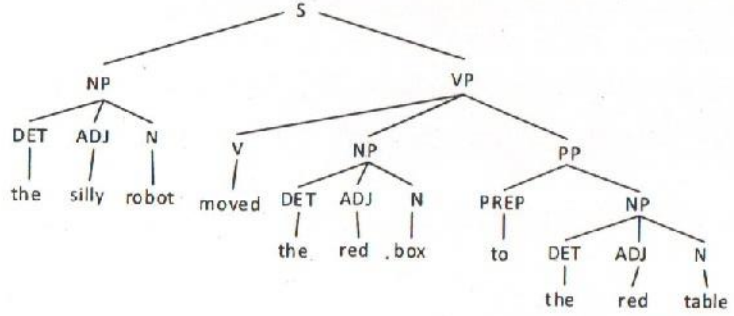

(b) What do you understand by alpha-beta cutoffs. Describe the method of alpha-beta pruning using these cutoffs with the help of an example. (4)

(c) Explain, why should the heuristic function of A* underestimate? (3)

7. (a) What is the use of "cut" utility in Prolog? (2)

(b) Describe Water-Jug problem and give its suitable state space representation. (4)

(c) Based on the context free grammar represented by the following parse tree, draw the corresponding Recursive Transition Network (RTN). (4)



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