[This question paper contains 4 printed pages.]

**Sr. No. of Question Paper : 6094** **D** **Your Roll No.....**

Unique Paper Code : 234607

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

Name of the Paper : Artificial Intelligence (CSHT–616) (ii)

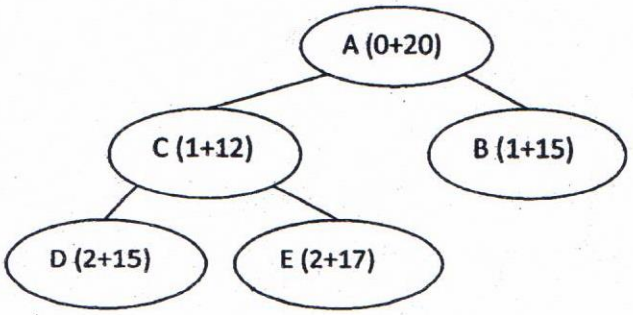
Semester : VI

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 No. **1** is compulsory.
3. Attempt any **4** of Question Nos. **2** to **7.**
4. Parts of a question must be answered together.

1. (a) Determine the next node which will be expanded next in Figure below using Best First Search. (3)




(b) Discuss the scope and limitations of knowledge representation using Propositional Logic. (4)

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

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

S : (P & Q) → R V ~Q (3)

*P.T.O.*

(e) Define a rational agent. What do you understand by agent autonomy ? (4)

(f) Transform the sentence : $(P \rightarrow Q) \rightarrow R$ into conjunctive normal form. (3)

(g) Differentiate between monotonic reasoning and non-monotonic reasoning. (4)

(h) Represent the sentence "Ram gave a book to Sohan" using Conceptual Dependency structure. (3)

(i) Develop a parse tree for the sentence: Jack slept on the table: using the following rules.

| | | |
|---|---|---|
| S | → | NP VP |
| NP | → | N \| DET N |
| VP | → | V PP |
| PP | → | PREP NP |
| N | → | jack \| table |
| V | → | slept |
| DET | → | the |
| PREP | → | on |

(4)

(j) Describe how alpha-beta pruning improves the searching procedure in a MIN-MAX game. (4)

2. (a) What do you understand by underestimation and overestimation of a heuristic function ? Under what condition A* gives optimal solution. (6)

(b). What are the limitations of Hill Climbing search. (4)

3. (a) Sam, Clyde and Oscar are elephants. We know the following facts about them :

A1 : Sam is pink.

A2 : Clyde is gray and likes Oscar.

A3 : Oscar is either pink or gray (but not both).

(i) Translate statements Al to A3 into clausal form. (3)

(ii) Use resolution to prove that "A gray elephant likes a pink elephant". (4)

(b) Describe the properties of Chomsky's type 2 grammar. (3)

4. (a) Write the Conceptual Graph and FOPL representation for the following sentence :

"Every bank has a locker" (4)

(b) Given formulas $S_1$ and $S_2$ below, show that Q(a) is al logical consequence of the two.

S1: $(\forall x((P(x) \rightarrow (Q(x))$ S2: P(a) (4)

(c) Define a well formed formula (wff). (2)

5. (a) Differentiate between Deterministic and Stochastic task environments. Give example. (5)

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

$$P(x_1,x_2,..., x_8) = P(x_8|x_6, x_7)\, P(x_7|x_4, x_5)\, P(x_6|x_2, x_3, x_4)\, P(x_5)\, P(x_4|x_1)\, P(x_3|x_1)\, P(x_2|x_1)\, P(x_1)$$

Draw the causal network for the same. (5)

6. (a) Create a frame network for terrestrial motor vehicles (cars, trucks, motorcycles) and give one complete frame in details for cars which include the slots for the main component parts, their attributes, and relations between parts. (5)

(b) What is a Recursive Transition Network ? Explain, with an example. (5)

*P.T.O.*

7. (a) Transform the sentence : ~(P & Q) & (P V Q) into disjunctive normal form. (3)

(b) Which one among Best First Search or A* is better to search an optimal path to a node, and why ? (4)

(c) Describe, how a sentence is represented using Case Grammar. (3)