This question paper contains **4** printed pages]

Roll No. ☐☐☐☐☐☐☐☐☐☐

S. No. of Question Paper   : **1491**

Unique Paper Code   : **2341701**

                                                        F-7

Name of the Paper   : **Artificial Intelligence**

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

Semester,   : **VII**

Duration : **3 Hours**   Maximum Marks : **75**

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

Question No. **1** is compulsory.

Attempt any *four* from Question Nos. **2** to **7.**

Parts of a question must be answered together.

1. (*a*) Define an Agent, Agent Function and an Agent Program.   3

   (*b*) Differentiate between knowledge-based systems and expert systems.   4

   (*c*) Why is state space representation important ?   2

   (*d*) Is minimax procedure Depth-first or Breadth-first ? Justify your answer. 2

   (*e*) Is the following set unifiable ? If yes, obtain a most general unifier for it : 3

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

   (*f*) Obtain Skolem standard form for the following :   3

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

                                                                    P.T.O.

(g) Explain utility function measure for an agent.   2

(h) Discuss special cases of hill climbing : Local Maximum, Plateau and Ridge.   3

(i) Express the following sentences as conceptual dependency structures :   6

    (i) Bill is a programmer

    (ii). Joe gave Sue a flower.

(j) What are the main differences between scripts and frame structure ?   3

(k) A 3-feet tall monkey is in a room, where some bananas are suspended from 8-feet high ceiling. The room contains two stackable, movable and climbable 3-feet high crates. Give the initial state, goal state, successor function and cost function for getting the bananas.   4

2. (a) Let h' denote the estimate of h (the actual cost of traversing 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 :   6

    (i) h' always underestimates h.

    (ii) h' always overestimates h.

(b) Consider a state space where the start space is number 1, and the successor function for a state n returns two states numbered $2n$ and $2n + 1$:   4

    (i) Draw the portion of state space for states 1 to 15.

    (ii) Suppose the goal state is 11. List the order in which nodes will be visited for breadth — first search.

3. (a) Explain Cut, Fail and Cut-fail statements in PROLOG.   6

(b) Write a PROLOG program to find GCD of two numbers.   4

4. (a) Explain Turing Test approach to AI. How is Turing Test approach different from Rational Agent approach ? 6

(b) Develop PEAS description of the task environment for — Internet book-shopping agent. 4

5. (a) Using constraint satisfaction algorithm, solve the following crypt arithmetic problem : 6

$$\begin{array}{r} O\,D\,D \\ +\,O\,D\,D \\ \hline E\,V\,E\,N \end{array}$$
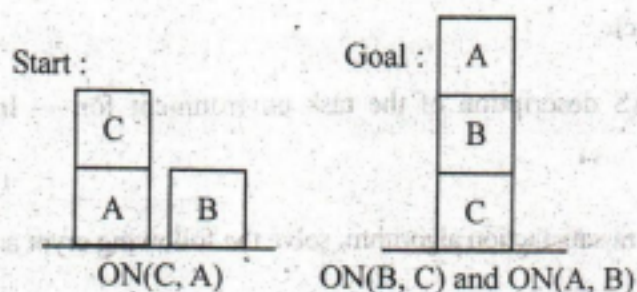
(b) A game tree is as follows : 4
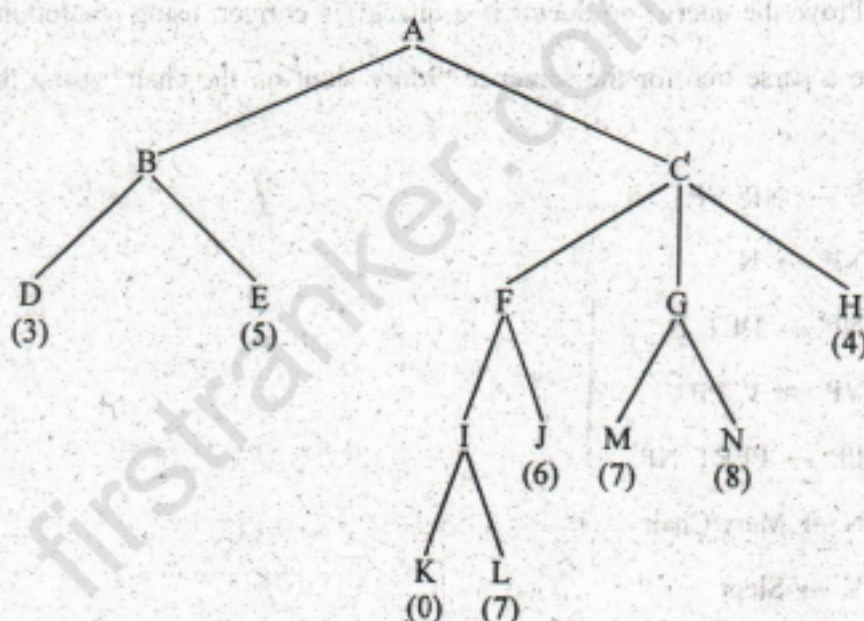
Which nodes would not be examined using alpha-beta pruning procedure ? Write a stepwise explanation.

6. (a) Discuss the differences and similarities between problem solving and planning. 5

P.T.O.

(b) Consider the following block world problem and solve it using goal stack planning : 5

Start :   Goal :

ON(C, A)   ON(B, C) and ON(A, B)

7. (a) Consider the following piece of knowledge :   6

Some patients like all doctors.

No patient like any quack.

(i) Represent this knowledge as predicate statements.

(ii) Prove the query "no doctor is a quack" is correct, using resolution method.

(b) Derive a parse tree for the sentence "Mary slept on the chair" using the following rules :   4

S → NP VP

NP → N

NP → DET N

VP → V PP

PP → PERT NP

N → Mary/Chair

V → Slept

DET → the

PERP → on