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

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

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

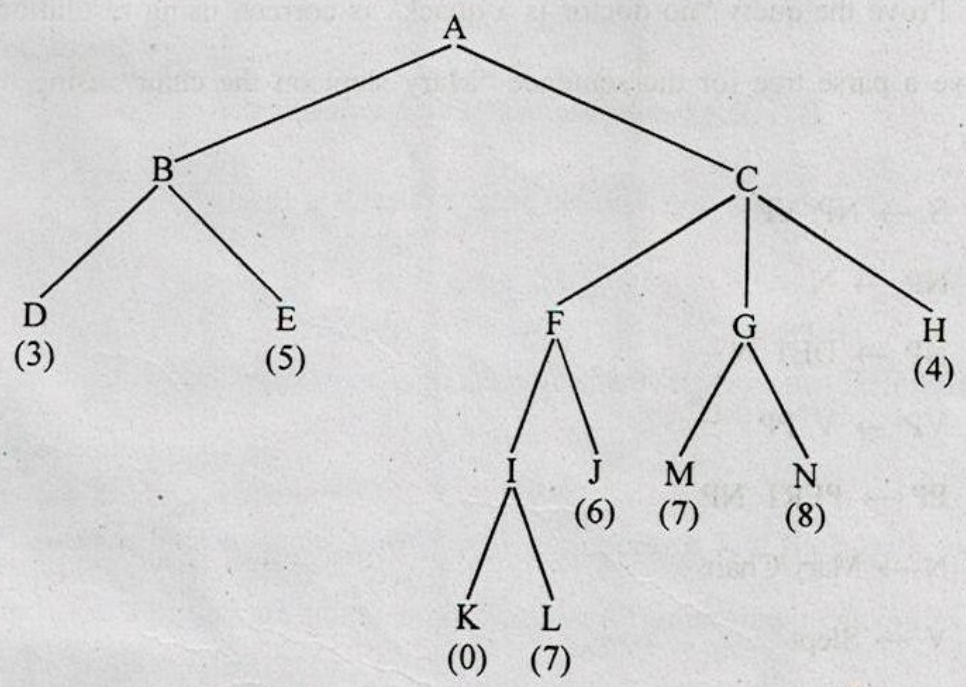
4. (*a*) Explain Turing Test approach to AI. How is Turing Test approach different from Rational Agent approach ? 6

(*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

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

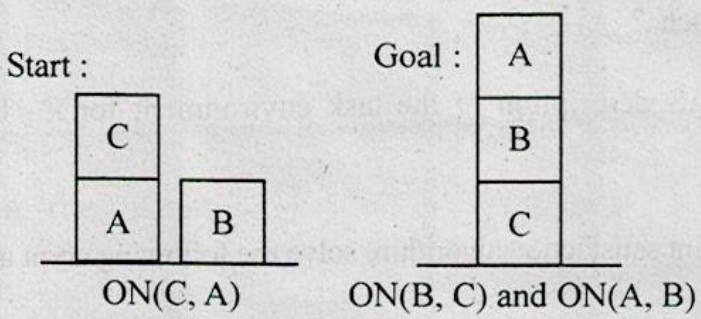
(*b*) A game tree is as follows : 4




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

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




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

$S \rightarrow NP\ VP$

$NP \rightarrow N$

$NP \rightarrow DET\ N$

$VP \rightarrow V\ PP$

$PP \rightarrow PERT\ NP$

$N \rightarrow$ Mary/Chair

$V \rightarrow$ Slept

$DET \rightarrow$ the

$PERP \rightarrow$ on