Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

V SEMESTER B.TECH. (INFORMATION TECHNOLOGY/ COMPUTER & COMMUNICATION ENGINEERING)

MAKE UP EXAMINATIONS, JAN 2017

SUBJECT: PROGRAM ELECTIVE II: ARTIFICIAL INTELLIGENCE [ICT 4009]

REVISED CREDIT SYSTEM
(07/01/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. A goal based agent with an explicit goal can reason about its actions to achieve the goal. How is this made possible in contrast to condition-action rules of a reflex agent? What are the additional details incorporated in goal based agent design? **5M**

1B. Consider a Depth First Search (DFS) in which all successors are generated at a time. Work out the memory requirements by creating a search tree of depth m=3 and branching factor b=2. In your search tree, mark all the nodes that are to be stored during the traversal. Assume that the goal node is the leftmost node at depth 3. **3M**

1C. Briefly describe rational agent. **2M**

2A. Write the function for Depth Limited search using Python. **5M**

2B. Write A* search algorithm and trace the algorithm with suitable example. **3M**

2C. Convert the given sentence into CNF considering the Wumpus world scenario.

i) $B_{1,1} \Leftrightarrow (P_{1,2} \vee P_{2,1})$

ii) $B_{2,1} \Leftrightarrow (P_{1,1} \vee P_{2,2} \vee P_{1,3})$ **2M**

3A. Write the alpha-beta pruning algorithm. For the zero sum game scenario given in Figure Q.3A, determine the nodes which are pruned when alpha-beta pruning is applied. Show clearly the trace of algorithm.

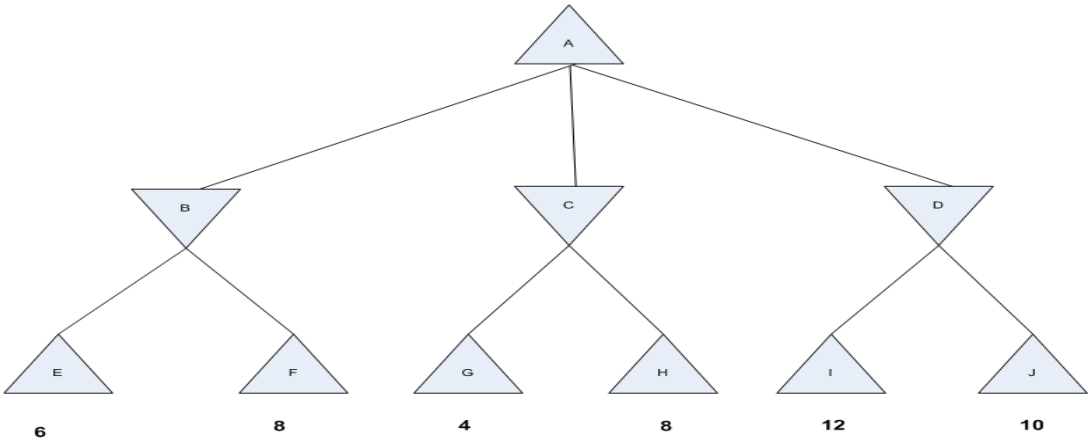

Figure Q.3A

5M

3B. Consider an air cargo transport problem involving loading and unloading cargo and flying it from place to place. The problem can be defined with three actions: Load, Unload and Fly. The actions affect two predicates: In(c,p) means that cargo c is inside plane p, and At(x,a) means that object x (either plane or cargo) is at airport a. When a plane flies from one airport to another, all the cargo inside the plane goes with it. Using PDDL represent initial state, goal state and set of action schemas. **3M**

3C. With an example explain arc consistency method in Constraint Satisfaction Problems (CSP). **2M**

4A. Using propositional logic show that the argument "It is not sunny this afternoon and it is colder than yesterday," "We will go swimming only if it is sunny this afternoon," "If we do not go swimming, then we will take a canoe trip," and "If we take a canoe trip, then we will be at home by sunset" lead to the conclusion "We will be home by sunset." **5M**

4B. Explain the following with respect to Knowledge representation in AI.

i) Ontology
ii) Categories
iii) Objects

3M

4C. Decide whether each of the following sentences is valid, unsatisfiable or neither. **2M**

i) Smoke $\vee$ Fire $\vee$ $\neg$Fire
ii) (Smoke $\Rightarrow$ Fire) $\Rightarrow$ ($\neg$Smoke $\Rightarrow$ $\neg$Fire)

5A. Show a Semantic Net representation of the following knowledge:
Tom is a cat.
Tom caught a bird.
Tom is owned by John.
Tom is ginger in colour.
Cats like cream The cat is sat on the mat.
A cat is a mammal.
All mammals are animals.
Mammals have fur.
5M

5B. Explain least- commitment search. Show the schematic representation **3M**

5C. Express the following sentences in the first-order logic.
i) No student buys an expensive gift.
ii) If x is a professor of y or x is the supervisor of y then x is the teacher of y. **2M**