Indian Institute of Engineering Science and Technology, Shibpur

8th Semester B. Tech. CST Final Examination, 2021

Artificial Intelligence (CS-801)

Full Marks-70 **Time- 1 Hour 30 minutes.**

Answer FOUR Questions taking at least ONE from each Group

Group- A

1. a) Convert the following to appropriate Symbolic Logic wffs.
   - i) I know someone is out to get me.
   - ii) If one proposition is *possible* while another is *not*, then their disjunction is *possible.*
   - iii) If you know do you know that you know.
   - iv) If God sees that Socrates is seated then it is *necessary* truth that Socrates is seated.

   b) Consider the following statements:

   A1: If the maid stole the jewellery then the butler wasn't guilty.
   A2: Either the maid stole the jewellery or she milked the cow.
   A3: If the maid milked the cow then the butler got his cream.
   C: Therefore, if the butler was guilty then he got his cream.
   Demonstrate that the conclusion C is valid using Propositional Logic.

   (8+9.5)

2. Consider the following piece of knowledge:

   Amar, Akbar and Antony belong to the Himalayan Mountaineering Institute. Every member of the Mountaineering Institute who is not a skier is a mountain climber. Mountain climbers do not like rain, and anyone who does not like snow is not a skier. Akbar dislikes whatever Amar likes and likes whatever Amar dislikes. Amar likes rain and snow.

   Represent this knowledge as a set of predicate calculus statements and use answer extraction to obtain the answer to the query " Is there a member of the Himalayan Mountaineering Institute who is a mountain climber but not a skier?" (17.5)

Group- B

3. a) Discuss with suitable examples that while best first search may not find optimal path to a goal A* algorithm will always find optimal path to the goal.
   b) Write A* algorithm assuming search space to be a tree. (9+8.5)

4. a) What is a Production System model of computation? Compare it with human problem solving model. Discuss the advantages of production system model in solving in AI problems.
   b) Write Depth First Search algorithm assuming search space to be graph. [(4+2+4)+7.5]

Group- C

5. Write Prolog programs
   a) To exchange the first and last elements of a list.
   b) To perform circular_left_shift(L, L1) of a list. That is, if L= [a, b, c, d, e, f] then L1= [b, c, d, e, f, a].
   c) To perform circular_right_shift(L, L1) of a list using 5.(b). That is, if L= [a, b, c, d, e, f] then L1= [f, a, b, c, d, e]
   d) To perform Quick Sort using an accumulator. (4+4+4+5.5)

6. a) Write an algorithm to perform resolution in propositional logic.
   b) Write Prolog programs
      i) To find permutation of a list of integers.
      ii) To perform permutation sort.
      iii)To find next higher permutation of a list of integers. [6+(3+3+5.5)]