ROLL NO. _____

Code: CT71 **Subject: ARTIFICIAL INTELLIGENCE**

ALCCS

Time: 3 Hours **June 2017** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE:

- **Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.**
- **Parts of a question should be answered at the same place.**

Q.1 a. State the significance of using heuristic functions.

b. What is a constraint satisfaction problem?

c. List out the advantages of nonmonotonic reasoning.

d. Distinguish between supervised learning and unsupervised learning.

e. Explain Hill Climbing algorithm and discuss its drawbacks.

f. Explain the concept of planning with state space search. How is it different from partial order planning?

g. Illustrate the use of First order logic to represent the knowledge. **(7×4)**

Q.2 a. Explain A* algorithm with a suitable example. State the limitations in the algorithm. **(8)**

b. Consider the sentence " The auditorium is full' the associated lexicon and grammar are as follows: **(5)**

Article → The	S → NP VP
Noun → auditorium	NP → Article Noun
Verb → is	VP → Verb Adj
Adj → full	

Draw the parse tree. Indicate how top down parsing and bottom up parsing carried-out.

c. Describe briefly each of the components of an expert system shell. **(5)**

Q.3 a. Describe the process involved in communication using the example sentence "The wumpus is dead". **(8)**

b. For each of the following formulae, construct a truth-table, and then determine whether it is valid, consistent or inconsistent:

(i) $(\sim C \rightarrow \sim D) \rightarrow (D \rightarrow C)$ **(4)**

(ii) $((\sim C \vee D) \rightarrow B) \rightarrow (\sim C \rightarrow B)$ **(6)**

Q.4 a. Translate first statements, given in the following argument into Propositional Logic, and then show that the conclusion logically follows from the premisses (given statements):
Premisses: Either taxes are increased, or if expenditures rise, then the debt ceiling is raised. If taxes are increased, then the cost of collecting taxes increases. If a rise in expenditures implies that the government borrows more money, then if the debt ceiling is raised, then interest rates increase. If taxes are not increased and the cost of collecting taxes does not increase, then if the debt ceiling is raised, then the government borrows more money. The cost of collecting taxes does not increase. Either interest rates do not increase or the government does not borrow more money.
Conclusion: Either the debt ceiling is not raised or expenditures do not rise. You may use the symbol: (T: Taxes are increased. E: Expenditures rise. D: The debt ceiling is raised, C: The cost of collecting taxes increases. G: The government borrows more money. I: Interest rates increase). **(12)**

b. Explain the Probabilistic reasoning. **(6)**

Q.5 a. Translate the following three statements in First Order Predicate Logic, and then deduce (iii) from (i) and (ii): **(10)**
(You should not use resolution method)
(i) Lord Krishna is loved by everyone who loves someone.
(ii) No one loves nobody
(iii) Lord Krishna is loved by everyone.

b. What is an agent? Discuss briefly different (at least four) types of agents. **(8)**

Q.6 a. Write a PROLOG programme that answers questions about family members and relationships. Include predicates and rules which define sister, brother, father, mother, grandfather, grand-child and uncle. The programme should be able to answer queries such as the following: **(10)**
? – father (X, mohit)
? – grandson (X, Y)
? – uncle (abdul, ruksana)
? – mother (mary, X)

b. Give Semantic Net representation of the facts given below:
"Ramesh is a 52 years old Professor of Mathematics in Delhi University. The name of his wife, son and daughter are respectively Seema, Yash and Kavita". **(8)**

Q.7 a. For the following fuzzy sets:
$X = \{x/7, y/3, z/0, u/1, v/4\}$ and
$Y = \{x/3, y/8, z/6, u/9, v/0\}$
Find (i) $X \cup Y$ (ii) $X \cap Y$ (iii) $(X' \cap Y)'$ **(2+2+3)**

b. Discuss briefly various methods/mechanism for handling incompleteness of a knowledge-base (KB). **(6)**

c. Illustrate the learning from examples by induction with suitable examples. **(5)**