Note: Attempt all questions.

1 Attempt any four parts: \(5 \times 4 = 20\)

(a) What do you understand by Artificial Intelligence? Why is AT important?

(b) Discuss the problem of "Water Jug problem" with Heuristic search techniques.

(c) Differentiate between Depth-first search and Breadth-first search.

(d) Explain AO* algorithm with example.

(e) When will Hill climbing search technique fail? Do steepest ascent hill climbing always find solutions? How might some problem be overcome in search?

(f) Define and describe the difference between knowledge, belief, hypothesis and data.
Attempt any four parts:

(a) Explain Top Down parsing techniques with examples.

(b) Explain different type of Chomsky's hierarchy grammars.

(c) Differentiate between deterministic and nondeterministic parsers.

(d) Develop a parse tree for the sentence "Mr. Kushwaha on the table" using the following rules:

\[
S \rightarrow NP \ VP \\
NP \rightarrow N \\
NP \rightarrow DET \ N \\
VP \rightarrow VPP \\
PP \rightarrow PREP \ NP \\
N \rightarrow \text{Mr. Kushwaha / table} \\
V \rightarrow \text{Slept} \\
DET \rightarrow \text{the} \\
PREP \rightarrow \text{ON}
\]

(e) Explain Fillmore's case grammar with example.

(f) Write short notes on sentence generation.
3 Attempt any two parts:

(a) (i) Explain semantic Nets with example.

(ii) Draw a hierarchical network to represent the information.
Mouse is a rodent; rodent is a mammal; 
A mammal has color and also drinks water.

(b) Explain Inference Rules in brief with example. 
Represent such expression in FOPL.

(i) All employees earning $500 or more per year pay taxes.

(ii) Some employees are sick today.

(c) Explain Horn clause. What is the procedure of clausal conversion with example?

4 Attempt any two parts:

(a) Differentiate between expert system and problem solving system. Why is it important that an expert system be able to explain the why and how question related to a problem solving session?

(b) Write short notes on:

(i) MYCIN

(ii) Compare the different type of problem solved by MYCIN and DENDRAL.

(c) Explain Meta knowledge. Under what conditions would it make sense to use both forward and backward chaining? Give an example where both are used.
Attempt any two questions: 10х2=20

(a) What is LISP? Why is it popular among AI practitioners? Write a LISP program which returns the minimum of three numbers.

(b) (i) What do you understand by pattern recognition?

(ii) Differentiate between structured description and symbolic description.

(c) Explain PROLOG. Write a PROLOG program that creates knowledge base of family relationships such as father, mother, brother, sister, parents. Use clauses such as male, female to define rules.