

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: M.TECH
BRANCH: CS

SEMESTER : II
SESSION : SP/19

SUBJECT: CS512 ARTIFICIAL INTELLIGENCE

TIME: 3.00 Hrs.

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) (I) Differentiate between the following terms (any three): [2+3]
- Intelligent agent vs rational agent.
 - Agent function vs agent program.
 - Single agent vs multiagent task environments.
 - Rationality vs omniscience.
- (II) For the following agent, develop a PEAS description of the task environment:
- a) An automated taxi.
 - b) Part-picking robot.

- Q.1(b) (I) Explain goal-based agents with proper diagram. [2+3]
- (II) Consider 'Water Jug Problem' and describe the followings-
- a. The problem statement (problem definition as a state space search).
 - b. The production rules for moving within the search space.
 - c. The starting, goal state(s) and one solution to the problem.
 - d. How BFS (**Breadth first search**) works in this example.
- Explain the advantages and disadvantages of BFS.

- Q.2(a) (I) What is problem solving agent. Explain why problem formulation must follow goal formulation. [1+2+2]
- (II) Give the states, initial state, goal state, successor function and cost function for the following. Choose a formulation that precise enough to be implemented and show the state space representation of this problem.
- "Use an example -The 8-puzzle problem, an instance of which is shown in fig. consists of 3x3 boards with 8 numbered tile and a blank space. A tile adjacent to the blank space can slide into the space. The object is to reach a specified goal state, such as the one shown on the right of the fig."

2	8	3
1	6	4
7		5

Initial State

1	2	3
8		4
7	6	5

Goal State

- (III) Describe Depth Limit search and iterative deepening depth first search. Among these two search techniques, which is the preferred uninformed search method when there is a large search space and the depth of the solution is not known.
- Q.2(b) (I) What is the drawback of greedy best-first search and how A* search strategy overcome this problem. Describe A* search strategy with the help of following characteristics: Admissible heuristic, consistency, monotonicity, triangular inequality and optimality. [3+2]
- (II) A hill climbing algorithm that never makes downhill moves towards the state with lower value is guaranteed to be incomplete, because it gets stuck on a local maximum. Describe how simulated annealing overcomes this drawback of hill climbing method and explain the simulated annealing algorithm.
- Q.3(a) What is the problem with minimax search algorithm? How Alpha-Beta pruning algorithm overcome this problem. Explain Alpha-Beta pruning algorithm with example. Measure the performance of this algorithm in terms of time complexity. [5]

- Q.3(b) Consider the following sentences: [5]
- John likes all kinds of food.
 - Apples are food
 - Chicken is food
 - Anything anyone eats and is not killed by is food
 - Bill eats peanuts and is still alive
 - Sue eats everything Bill eats
- i) Translate these sentences into predicate logic.
 - ii) Prove John likes peanuts using backward chaining.
 - iii) Convert the formula of part a into clausal form.
 - iv) Prove that john likes peanuts using resolution.
 - v) Use resolution to answer the question "what food does Sue eat?".

- Q.4(a) (I) Differentiate between Forward and backward reasoning with example. [1+2+2]
 (II) Explain the various approaches to knowledge representation.
 (III) Differentiate between nonmonotonic reasoning and default reasoning. How 'Truth maintenance system (TMS)' is used to represent nonmonotonic reasoning? Consider the following statements:

- (i) Cybil is a bird
- (ii) Cybil can fly
- (iii) Cybil cannot fly
- (iv) Cybil has wings
- (v) Cybil is an ostrich

How TMS will justify the current belief set that represents 'Cybil as a non-flying bird (Cybil is an ostrich)' with the help of above lists

- Q.4(b) What is Natural language processing. Explain briefly - Morphology analysis, syntactic processing, Semantic analysis, and Pragmatic analysis of NLP. [5]

- Q.5(a) What is Planning-explain. Consider the following Blocks world problem: show how STRIPS in Goal Stack planning would solve this problem. [5]



START

Start: ON (A, B) AND
 ON (C, D) AND ONTABLE(B)
 AND ONTABLE (D) AND ARMEMPTY

GOAL

Goal: ON (C, B) AND ON (D, A) AND ONTABLE(B)
 AND ONTABLE (A)

- Q.5(b) Write short notes (any Two): [2.5*2]
- (I) Inductive Learning.
 - (II) Dempster-Shafer theory.
 - (III) Cryptarithmic problem as a Constraint satisfaction problem [Example: CROSS+ROADS=DANGER].