CLASS: BTECH   SEMESTER: VII
BRANCH: CHEMICAL/EEE/ECE/ME/PIE   SESSION:MO/2022

SUBJECT: IT420 ARTIFICIAL INTELLIGENCE

TIME: 03 Hours   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. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

----

Q.1(a)   (I) **Differentiate the following terms (any two):**   [1x2=2]
         -Rational agent vs Autonomous agent
         -Bounded rationality vs Perfect rationality.
         -Turing Test vs The Chinese room argument.
         -Is AI a science, or is it engineering? Or neither or both? Explain.

Q.1(b)   (I) Give a **PEAS** description of the task environment and characterize it in terms of the properties: [1.5+1.5=3]
         "Shopping for used AI books on the Internet".

         (II) Write down the task environment of the following:

Task Environment	Fully / Partially overserved env.	Single/ Multiagent Env.	Deterministic/ Stochastic/ Strategic	Episodic/ Sequential	Discrete/ Continuous
Automated Taxi driving					

Q.1(c)   Define how agent architectures are modified from model-based agent to goal-based agent and   [5]
         from goal-based agent to utility-based agent in partially observed environment **(take vacuum
         agent an example).**

Q.2(a)   (I) Describe the following: [1.5+1.5=3]

         (a)   The 8-puzzle consists of a 3×3 board with 8-PUZZLE eight numbered tiles 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 figure:

                 Initial State   **Final State**

         By using left, right, up, and down action sequences **show the one solution using Best First
         Search.**

         (b) In CSP problem, solve the following cryptarithmetic problem:
                 SEND
             +   MORE

                 MONEY

Q.2(b)   (I) Consider **"Water Jug Problem"** and describe the followings-   [2.5+1.
  a. The problem statement (problem definition as a state space search).   5=4]
  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.

(II) Evaluate time complexity (TC) and space complexity (SC) of **Breadth First Search and Iterative deepening depth-first search**. Both the cases time complexities are same, but space complexities are different, if b=10 and d=5, find out the numbers of nodes, TC and SC. (consider, 1 million nodes can be generated per second and that a node requires 1000 bytes of storage.)

Q.2(c)   Describe **A* search algorithm** with example and find out its time and space complexity. Also   [3]
write down its **characteristics of A* search**: Admissible heuristic, consistency, triangular
inequality, and optimality.

Q.3(a)   Write Alpha Beta algorithm and explain with example and mention its time complexity in best,   [2]
average and worst case.

Q.3(b)   Write all the approaches to knowledge representation.   [3]

Q.3(c)   Consider the following statements: [5]

   I. John likes all kind of food.

   II. Apple and vegetable are food

   III. Anything anyone eats and not killed is food.

   IV. Anil eats peanuts and still alive

   V. Harry eats everything that Anil eats.

   (a) Convert all-natural language statement in **Predicate Logic format**.

   (b) Then convert **Predicate logic to clausal format**.

   (c) **)** Prove by **resolution** that: "John likes peanuts".

Q.4(a)   Differentiate **Forward vs Backward Reasoning**.   [2]
Q.4(b)   Explain **Monotonic, Non-Monotonic and Default Reasoning** with examples.   [3]
Q.4(c)   Write short notes on **(any two):**   [2x2.5=
  (a) Bayesian Network   5]
  (b) Hierarchical Planning
  (c) Induction Learning
  (d) Genetic Algorithm

Q.5(a)   (a) Define the terms NLP, NLU and NLG. Explain briefly **- Morphology analysis, syntactic**   [5]
processing, Semantic analysis, and Pragmatic analysis of NLP.

Q.5(b)   (b) Define the term robotics. Write down the **hardware component of rob**ot and its **path**   [5]
planning algorithms in certain and uncertain domain.

:::::25/11/2022:::::M