

**VIT**

Vellore Institute of Technology

Final Assessment Test – November 2024

Course: BITE308L - Artificial Intelligence

Class NBR(s): 3401 / 3404 / 3409

Time: Three Hours

Slot: D2+TD2

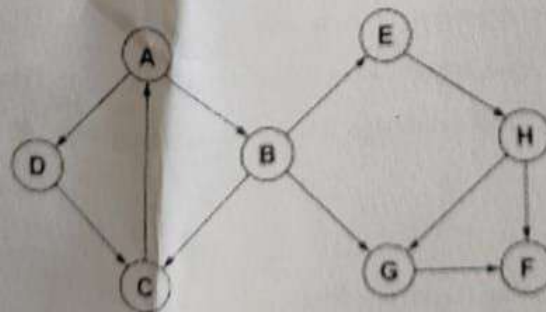
Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

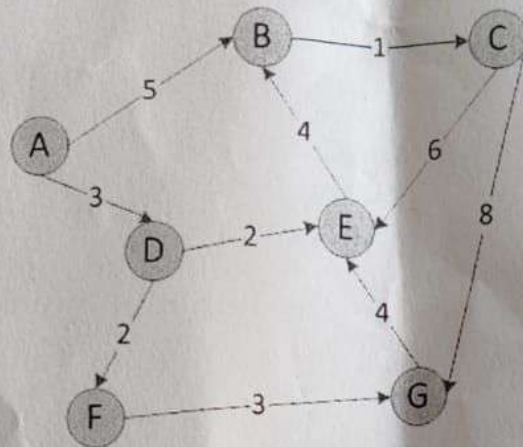
Answer ALL Questions

(10 X 10 = 100 Marks)

1. Identify the task environment types and PEAS for the following jobs.
 - a) Performing a gymnastics floor routine
 - b) Virtual Personal Assistants
 - c) Robot Vacuum
 - d) Going on a hike to a mountain top.
2. You are tasked with designing an intelligent agent system for a precision livestock farming operation to optimize animal health, productivity and resource management.
Discuss why a Learning-Based Intelligent Agent would be the most suitable type for this agricultural application. Provide insights into how this agent would adapt to changing conditions, gather data, and improve its decision-making over time. Support your answer with specific examples of how the agent might adjust feeding schedules, monitor animal behavior and manage environmental factors to achieve its goals.
3. Consider the following graph. Consider that we always choose the vertices in alphabetical order. Perform Breadth-First search & Depth-First search. Find the most cost-effective path to reach from start state A to final state F out of BFS & DFS traversals



4. Consider the following state-space representation of a problem. Find the most cost-effective path to reach from start state A to final state G using Uniform-Cost search Algorithm.



5. Take into consideration a **restaurant recommendation system** that has data about various restaurants, their cuisines, locations, and the preferences of users (like favorite cuisines and budget). It can make personalized recommendations by analyzing relationships such as cuisine types a user prefers, previous restaurant ratings, or locations they frequent.

Make a representation of the above system, where the restaurants, cuisines, locations, and customer preferences are assumed to be concepts and their relationships to be represented using **semantic network** representation.

6. Describe the following statements with Predicate logic and then into clausal form.
- Every student likes some teacher.
 - Arun takes either Biology or Computer science (but not both).
 - Every student who takes Mathematics also takes Science.
 - Ashok eats everything that Pranab eats.
 - Anything anyone eats and isn't killed by is food.
7. In a Crime Investigation scenario, a detective is trying to solve a case by determining if a suspect, John, is guilty based on various statements related to the crime scene, witnesses, and evidence. (Use *propositional logic & Proof by resolution*)

Premises:

P1: If John was at the scene of the crime, then he is guilty.

P2: If John is guilty, then he had the motive.

P3: If John was not at the scene of the crime, then he has an alibi.

p4: If there is an alibi, then he is not guilty.

p5: Witnesses saw John at the scene of the crime.

Conclusion:

John is guilty.

8. Apply Bayes' theorem appropriately to the scenario given below and find the answer.

In a certain city, 2% of the population has a rare disease. There is a test for this disease which is 95% accurate, meaning:

If a person has the disease, the test is positive 95% of the time (true positive).

If a person does not have the disease, the test is negative 95% of the time (true negative).

If a person receives a positive test result, what is the probability that they actually have the disease?

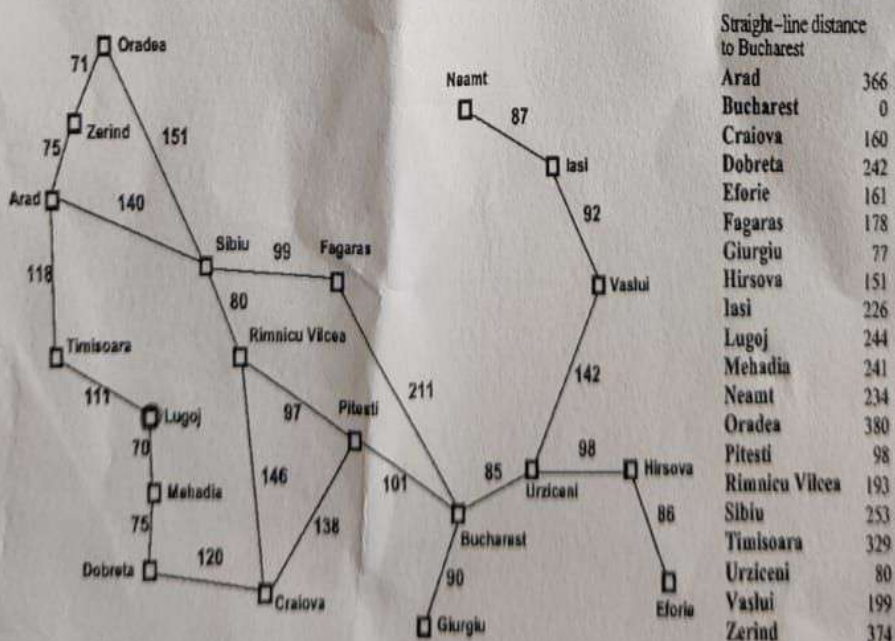
- 9.a) Consider a case study of vehicle routing, explain how heuristic search helps to make moves in the search space.

OR

- 9.b) Use A* Search algorithm to solve the Romanian problem.

The agent is on holiday in Romania and is currently located in the city of LUGOJ. Agent has a flight from BUCHAREST tomorrow, so it can't be changed. Now you need to find the shortest path to Bucharest.

Romania with step costs in km



- 10.a) A finite Turing machine has a finite one-dimensional tape of cells, each cell containing one of a finite number of symbols. One cell has a read and write head above it. There is a finite set of states the machine can be in, one of which is the *accept state*. At each time step, depending on the symbol on the cell under the head and the machine's current state, there are a set of actions we can choose from. Each action involves *writing a symbol to the cell under the head, transitioning the machine to a state, and optionally moving the head left or right*. The mapping that determines which actions are allowed is the Turing machine's program.

Assume that the goal is to control the machine into the accept state. Represent the Turing machine acceptance problem as a planning problem.

OR

- 10.b) Machine Learning (ML) plays a crucial role in the field of Artificial Intelligence (AI) by enabling systems to learn from data, adapt to new inputs, and improve their performance over time without explicit programming.

Describe at least 5 key points that outline the role and importance of machine Learning in Artificial Intelligence.

⇔⇔⇔ D/L/TX ⇔⇔⇔