Reg.No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. COMPUTER SCIENCE & ENGINEERING (AI&ML)
END SEMESTER EXAMINATION, MAY 2023

SUBJECT: ARTIFICIAL INTELLIGENCE [CSE 2271]

REVISED CREDIT SYSTEM

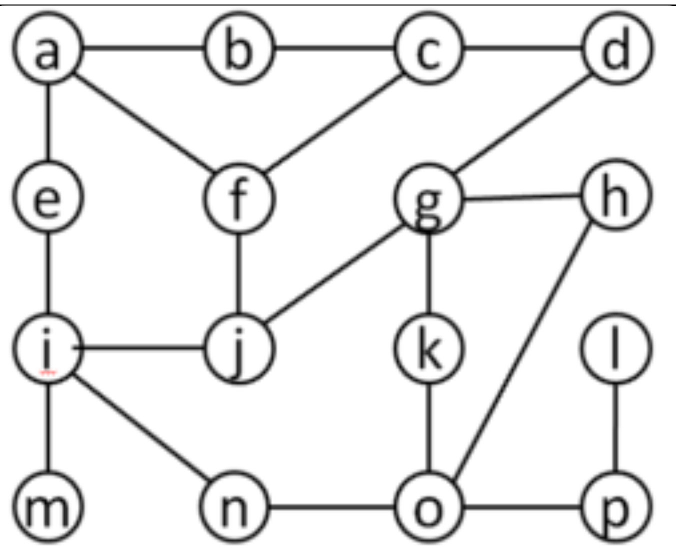
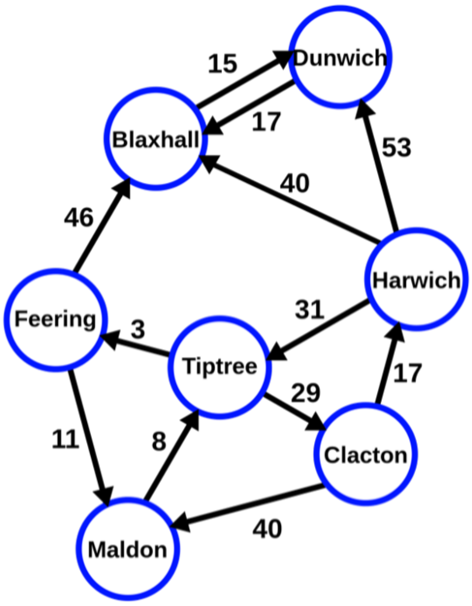
--/05/2023

Time: 3 Hours **MAX. MARKS: 50M**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A.	List and describe the various disciplines that acted as the foundations of artificial intelligence.	**(4M)**	**CO1**
1B.	Differentiate simple reflex agent and model based agents with suitable diagrams and pseudocodes.	**(4M)**	**CO2**
1C.	Describe the task environment properties for the following task environments with appropriate justifications. i) Medical Image Analysis ii) Chess with a clock iii) Health checkup iv) Part picking robot	**(2M)**	**CO2**
2A.	In the following undirected unweighted graph, consider **“a”** as the source node and **“g”** as the goal node. Identify the path between the source to destination using Breadth First Search (BFS) and Depth First Search (DFS) algorithms. Show the tree generation steps along with the queue and visited nodes lists for every step. Also, compare the performance of BFS and DFS with standard performance evaluation metrics.	**(4M)**	**CO3**

	 **Figure** 2A		
2B.	Discuss the 5 phases of genetic algorithm with a suitable pseudocode and an example.	**(4M)**	**CO2**
2C.	Rob is planning to move this summer from Harwich to Maldon. In the graph below, the vertices represents towns and the edges represent the cost of tolls that needs to be paid while travelling from one town to another. Rob needs to your advice in planning the trip; he wants to minimize the total amount paid for tolls. What route do you think he should take and how much would he have to pay over the entire journey tolls? Identify the best algorithm to solve given problem.  **Figure** 2C	**(2M)**	**CO3**
3A.	Consider the following graph to find the shortest path between the cities "Arad" to "Bucharest" using BFS and A* Search algorithms. Show the tree formation, path and total cost to reach the goal city "Bucharest". (The values given in "red" are heuristic values)	**(5M)**	**CO3**

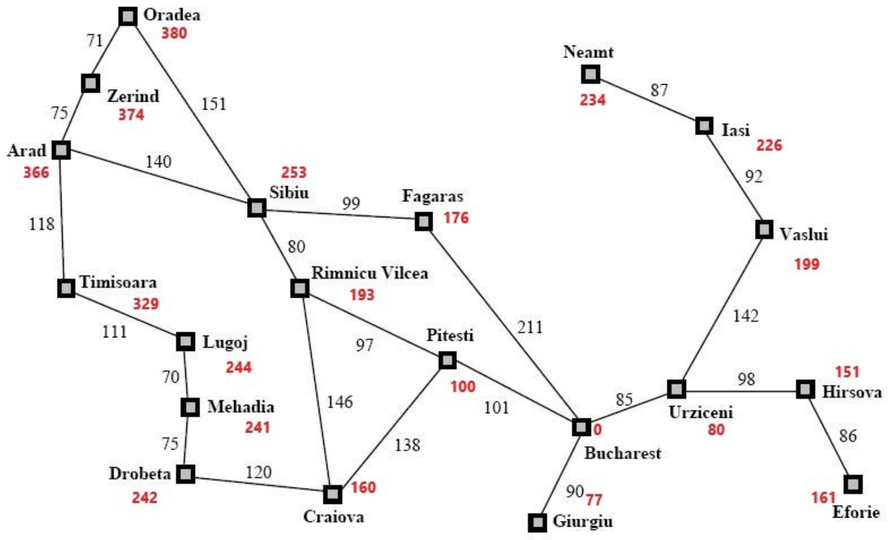


Figure 3A

3B. Solve the following cryptarithmetic problem using Constraint Satisfaction Problem logic. CROSS + ROADS = DANGER. **(3M)** **CO3**

Constraints:

1. Each Letter, Symbol represents only one digit throughout the problem.
2. The value for each letter is ranging between (0 to 9)

3C. Perform the minimax algorithm for given problem and show the optimal path. **(2M)** **CO3**

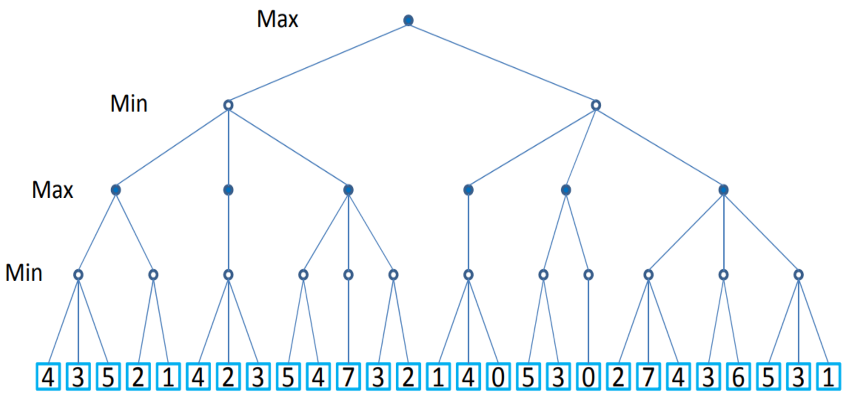


Figure 3C

4A. Represent the following statements using predicate logic. **(4M)** **CO4**

i) The best score in Greek is always higher than the best score in French

ii) Every person who buys a policy is smart.

iii) No person buys an expensive policy

iv) There is a barber who shaves all men in the town who do not shave themselves.

v) Politicians can fool some of the people all of the time, and they can fool all of the people some of the time, but they can’t fool all of the people all of the time

vi) A person born outside the UK, one of whose parents is a UK citizen

by birth, is a UK citizen by descent.
vii) A person born in the UK, each of whose parents is a UK citizen or a UK resident, is a UK citizen by birth.
viii) There is an agent who sells policies only to people who are not insured.

4B. i) The below axiom states that if an event e happens over the time interval $(t1, t2)$, and e initiates a fluent f at time $t1$, and f is not clipped (ceases to be true) during the interval $(t1, t)$, and t is a time after $t1$, then f is true at time t. Justify the below axiom with an example. **(4M)** **CO4**

$$Happens(e, (t1, t2)) \land Initiates(e, f, t1) \land \neg Clipped(f, (t1, t)) \land t1 < t \Rightarrow T(f, t)$$

ii) The below axiom states that if an event e happens over the time interval $(t1, t2)$, and e initiates a fluent f at time $t1$, and f is not clipped (ceases to be true) during the interval $(t1, t)$, and t is a time after $t1$, then f is false at time t. Justify the below axiom with an example.

$$Happens(e, (t1, t2)) \land Terminates(e, f, t1) \land \neg Restored(f, (t1, t)) \land t1 < t \Rightarrow \neg T(f, t)$$

4C. Describe the different properties of forward and backward chaining with an example? **(2M)** **CO4**

5A. Given that a doctor knows that meningitis causes a stiff neck 50% of the time, and the prior probability of a patient having meningitis is 1/40,000, and the prior probability of any patient having a stiff neck is 2%. Let s be the proposition that the patient has a stiff neck and m be the proposition that the patient has meningitis. What is the likelihood of the patient having meningitis given the presence of a stiff neck symptom? Use Bayes' rule to calculate the probability of disease given symptoms. **(4M)** **CO5**

5B. Below is an example of a full joint distribution for the toothache, cavity, and catch worlds, and it describes the presence or absence of cavities in a patient with a toothache. The probabilities in the table represent the likelihood of each possible combination of the variables. **(4M)** **CO5**

Computer conditional probabilities P(Toothache | cavity) and P(Cavity | toothache ∨ catch) using Bayes Theorem.

	toothache		*¬toothache*	
	catch	*¬catch*	*catch*	*¬catch*
cavity	0.108	0.012	0.072	0.008
¬cavity	0.016	0.064	0.144	0.576

Table 5B

5C. Explain desirable property of Rule-based methods for uncertain reasoning? **(2M)** **CO5**