USN | | | | | | | | | | |
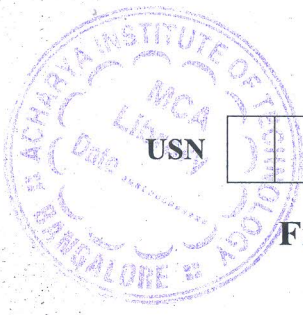
21CS54

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Artificial Intelligence and Machine Learning

Time: 3 hrs.   Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a. Identify the Turing test approach to provide a satisfactory operational definition of Intelligence. **(04 Marks)**
    b. Make use of the state space of the vacuum world and define the components to solve this problem. **(06 Marks)**
    c. Illustrate the properties and the algorithm for Breadth-first search technique. **(10 Marks)**

OR

2   a. Explain the concepts of thinking rationally and acting rationally. **(04 Marks)**
    b. Explain the tree search and graph search algorithms. **(06 Marks)**
    c. Explain problem solving agents alongwith the algorithm and illustrate the incremental formulation of 8-Queens problem. **(10 Marks)**

Module-2

3   a. Identify the differences between supervised and unsupervised learning. **(04 Marks)**
    b. Explain the types of Big data. **(06 Marks)**
    c. Apply A* algorithm to find the best path from Arad to Bucharest. [Refer Fig.Q3(c)].

A simplified road map of part of Romania.
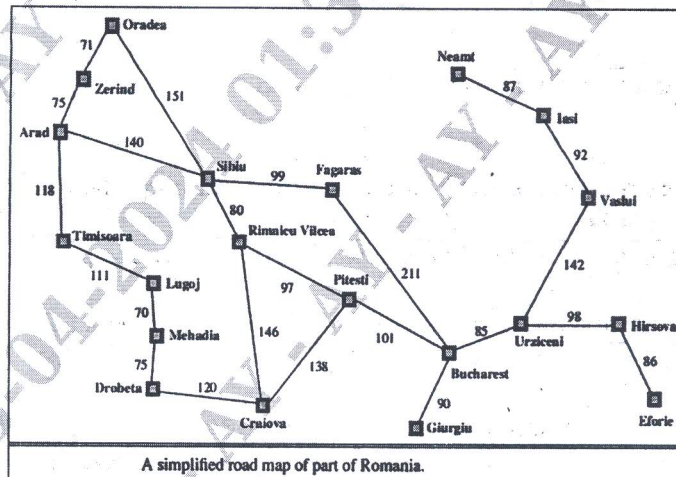
Arad	366	Mehadia	241
Bucharest	0	Neamt	234
Craiova	160	Oradea	380
Drobeta	242	Pitesti	100
Eforie	161	Rimnicu Vilcea	193
Fagaras	176	Sibiu	253
Giurgiu	77	Timisoara	329
Hirsova	151	Urziceni	80
Iasi	226	Vaslui	199
Lugoj	244	Zerind	374

Values of h_{SLD}——straight-line distances to Bucharest.

Fig.Q3(c)   **(10 Marks)**

OR

4 a. Explain the machine learning process model along with diagram. (06 Marks)

b. Consider the table given below which contains the machine learning course registration done by both boys and girls. There are 50 boys and 50 girls in the class and the registration of the course is given in the table. Apply Chi-square test and find out whether any differences exist between boys and girls for course registration.

Table 4(b)

Gender	Registered	Not Registered	Total
Boys	35	15	50
Girls	25	25	50
Total	60	40	100

(06 Marks)

c. Apply the heuristic search algorithm on the given 8 puzzle problem to reach the goal state from the given initial state.

Fig.Q4(c) (08 Marks)

Module-3

5 a. Consider the training dataset of 4 instances shown in the table below. Apply Find-S algorithm to find the final hypothesis.

Table 5(a)

CGPA	Interactiveness	Practical Knowledge	Communication Skills	Logical Thinking	Interest	Job Offer
29	Yes	Excellent	Good	Fast	Yes	Yes
29	Yes	Good	Good	Fast	Yes	Yes
28	No	Good	Good	Fast	No	No
29	Yes	Good	Good	Slow	No	Yes

(08 Marks)

b. Explain why Instance based learners are called lazy learners and compare instance based learning and model based learning. (06 Marks)

c. Explain the types of Regression methods with diagram. (06 Marks)

OR

6 a. Consider the student performance training dataset of 8 data instances in the below table. Based on the performance of a student, classify the test instance (6.1, 40, 5) to check whether the student will pass or fail in that course using KNN approach (K = 3).

Table 6(a)

S.No.	CGPA	Assessment	Project Submitted	Result
1	9.2	85	8	Pass
2	8	80	7	Pass
3	8.5	81	8	Pass
4	6	45	5	Fail
5	6.5	50	4	Fail
6	8.2	72	7	Pass
7	5.8	38	5	Fail
8	8.9	91	9	Pass

(12 Marks)

b. Explain version space and the candidate elimination algorithm explaining the algorithm steps. (08 Marks)

Module-4

7 a. Explain the advantages and disadvantages of decision trees. **(06 Marks)**
   b. Explain validating and pruning of decision trees. **(06 Marks)**
   c. Explain Bayes optimal classifier and solve to find whether a patient is diagnosed as COVID positive or COVID negative using the table given below.

Table 7(c)

$P(h_i/T)$	P(COVID positive)	P(COVID negative/h_i)
0.3	0	1
0.1	1	0
0.2	1	0
0.1	1	0

(08 Marks)

OR

8 a. Explain the procedure to construct a decision tree using ID3 algorithm. **(06 Marks)**
   b. Explain Bayes theorem, Maximum A Posteriori (MAP) Hypothesis (h_{MAP}) and Maximum Likelihood (ML) Hypothesis (h_{ML}). **(06 Marks)**
   c. Illustrate the algorithm of Naïve Bayes and explain the popular variants of Bayesian classifier. **(08 Marks)**

Module-5

9 a. Explain the different activation functions used in ANN. **(06 Marks)**
   b. Illustrate the various types of Artificial Neural Networks. **(08 Marks)**
   c. Illustrate the applications and challenges of Clustering algorithms. **(06 Marks)**

OR

10 a. Explain the perceptron model and the algorithm. **(08 Marks)**
   b. Consider the following set of data given in the below table. Cluster it using K-means algorithm with the initial value of objects 2 and 5 with the coordinate values (4, 6) and (12, 4) as initial seeds.

Table 10(b)

Objects	X-coordinate	Y-coordinate
1	2	4
2	4	6
3	6	8
4	10	4
5	12	4

(12 Marks)

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