

## Fifth Semester B.E. Degree Examination, June/July 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. Define the terms :  
 i) Artificial Intelligence    ii) Turing Test    iii) Total Turing Test  
 Summarize the capabilities required by computer to pass the turing test and total turing test. (10 Marks)
- b. Outline the following phases with respect to history of AI:  
 i) The birth of Artificial Intelligence  
 ii) AI Winter (10 Marks)

**OR**

- 2 a. Explain Simple-Problem-Solving-Agent with an algorithm. Also state the assumptions done in the process of agent design. (10 Marks)
- b. Illustrate the component of well-defined problems by formulating "Vacuum World" Toy problem. (10 Marks)

### Module-2

- 3 a. Infer the conditions for optimality of A\* algorithm. Given the following graph with initial state S, Identify the Goal state and solve for A\* algorithm. [Refer Fig.Q3(a)]

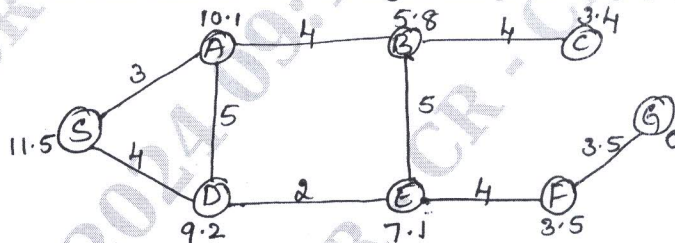


Fig.Q3(a)

- b. Define Machine Learning. Explain in detail the different types of machine learning with example. (10 Marks)

**OR**

- 4 a. What is dispersion of Data? Explain the different measures of data dispersion. (10 Marks)
- b. Explain PCA. Write the PCA algorithm. (05 Marks)
- c. Consider the following data of ML course registration. There are 50 boys and 50 girls in the class. Apply Chi-square test and find out whether any difference exists between boys and girls for course registration. [Assume :  $P = 0.0412$ ]

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

(05 Marks)

Module-3

- 5 a. Generate version space for the given dataset using candidate elimination algorithm.

CGPA	Interactiveness	Practical Knowledge	Communication skills	Logical Thinking	Interest	Job Offer
$\geq 9$	Yes	Excellent	Good	Fast	Yes	Yes
$\geq 9$	Yes	Good	Good	Fast	Yes	Yes
$\geq 8$	No	Good	Good	Fast	No	No
$\geq 9$	Yes	Good	Good	Slow	No	Yes

(10 Marks)

- b. Demonstrate the steps of Learning System Design. (05 Marks)

- c. Differentiate between Instance based learning and model-based learning. (05 Marks)

**OR**

- 6 a. List the different validation techniques of Regression methods. Explain any 4 techniques in detail. (10 Marks)

- b. Consider the following dataset:

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

Assuming  $K = 3$ , Classify the new instance (6.1, 40, 5) using KNN algorithm. (10 Marks)

Module-4

- 7 a. Illustrate the structure of Decision Tree, with its advantages and disadvantages. (10 Marks)

- b. Define the following terms:

i) Entropy                      ii) Information gain                      iii) GINI Index

iv) Pre-pruning                      v) Post-pruning

(05 Marks)

- c. Define Regression Tree. Write the algorithm for constructing Regression Trees. (05 Marks)

**OR**

- 8 a. State Bayes Theorem. Define MAP hypothesis and maximum likelihood. (06 Marks)

- b. Consider a boy who has a volleyball tournament on the next day, but he feels sick today. It is unusual that there is only a 40% chance he would fall sick since he is a healthy boy. Now, find the probability of the boy participating in the tournament. The boy is very much interested in volley ball, so there is 90% probability that he would participate and 20% that he will fall sick given that he participates in the tournament. (04 Marks)

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- c. Classify the given test data using Naïve Bayes algorithm. Apply Laplace correction if zero probability problem occurs.

Test data : [Assessment = Average, Assignment = 'Yes', Project = No and seminar = Good]

Given dataset :

S.No.	Assessment	Assignment	Project	Seminar	Result
1	Good	Yes	Yes	Good	Pass
2	Average	Yes	No	Poor	Fail
3	Good	No	Yes	Good	Pass
4	Average	No	No	Poor	Fail
5	Average	No	Yes	Good	Pass
6	Good	No	No	Poor	Pass
7	Average	Yes	Yes	Good	Fail
8	Good	Yes	Yes	Poor	Pass

(10 Marks)

### Module-5

- 9 a. Illustrate Meculloch and Pitts Neuron Mathematical model. Which are the different activation functions used in ANN? (10 Marks)
- b. Explain the different types of ANN. (04 Marks)
- c. Explain the architecture of Radial Basis Function Neural Network (RBFNN) along with algorithm. (06 Marks)

OR

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- 10 a. Differentiate between clustering and classification. (04 Marks)
- b. Write K-means algorithm. Give the cluster table after iteration 1 for the given data using K means algorithm with initial value of objects 2 and 5 with the coordinate values (4, 6) and (12, 4) as initial seed.

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

(06 Marks)

- c. Explain the different Cluster Evaluation methods. (10 Marks)

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