

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

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Course Code

22CA53

Fifth Semester B.E. Degree Examinations, February 2025

MACHINE LEARNING**(CSE-AI)**

Duration: 3 hrs

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Missing data, if any, may be suitably assumed

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBT:CO:PI)</u>
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Module-1

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|----|----|--|-----------|--------------------|
| 1. | a. | Explain the steps involved in designing checkers learning problem. | 12 | (2:1:1.3.1) |
| | b. | Apply Find-S algorithm for the following training data set and find the most specific hypothesis. Also find the number of distinct, semantically distinct & syntactically distinct hypothesis: | 08 | (3:3:1.3.1) |

ID	Restaurant	Meal	Day	Cost	Allergic Reaction
1	Sam's	Breakfast	Fri	Cheap	Yes
2	Kim's	Lunch	Fri	Expensive	No
3	Sam's	Lunch	Sat	Cheap	Yes
4	Jack's	Breakfast	Sun	Cheap	No
5	Sam's	Breakfast	Sun	Expensive	No

(OR)

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|----|----|---|-----------|--------------------|
| 2. | a. | Apply Candidate Elimination algorithm, to find the consistent hypothesis for the following training data set: | 10 | (3:3:1.3.1) |
|----|----|---|-----------|--------------------|

RID	Status	Floor	Dept.	Office Size	Recycle Bin
1	Faculty	Four	CS	Medium	Yes
2	Faculty	Four	EE	Medium	Yes
3	Faculty	Four	CS	Small	No
4	Faculty	Five	CS	Medium	Yes

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|----|--|-----------|--------------------|
| b. | Summarize the un-answered questions of Find-S algorithm. | 04 | (2:1:1.3.1) |
| c. | Explain inductive bias in candidate elimination algorithm. | 06 | (2:2:1.3.1) |

Module-2

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|----|----|--|-----------|--------------------|
| 3. | a. | Outline the steps involved in ID3 algorithm. | 08 | (2:1:1.3.1) |
| | b. | Demonstrate how decision tree incorporates continuous valued attributes. | 06 | (2:1:1.3.1) |
| | c. | Explain rule post pruning. | 06 | (2:1:1.3.1) |

(OR)

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|----|----|--|-----------|--------------------|
| 4. | a. | Explain how reduced error pruning can avoid over-fitting in decision tree. | 06 | (2:1:1.3.1) |
|----|----|--|-----------|--------------------|

- b. Construct Decision Tree for the training data set provided in the following table: 14 (3:4:1.3.1)

RID	Colour	Type	Doors	Tyres	Class
1	Red	SUV	Two	White wall	+
2	Blue	Minivan	Four	White wall	-
3	Green	Car	Four	White wall	-
4	Red	Minivan	Four	Black wall	-
5	Green	Car	Two	Black wall	+
6	Green	SUV	Four	Black wall	-
7	Blue	SUV	Two	Black wall	-
8	Blue	Car	Two	White wall	+
9	Red	SUV	Two	Black wall	-
10	Blue	Car	Four	Black wall	-
11	Green	SUV	Four	White wall	+
12	Red	Car	Two	Black wall	+
13	Green	SUV	Two	Black wall	-
14	Green	Minivan	Four	White wall	-

Module-3

5. a. Outline the steps involved in training a linear unit using gradient descent algorithm. 10 (2:2:1.3.1)
- b. Explain the steps involved in back-propagation algorithm for training an artificial neural network. 10 (2:1:1.3.1)

(OR)

6. a. Explain the appropriate scenarios suitable for the application of ANN. 06 (2:1:1.3.1)
- b. Consider the following training set & identify weight vector for one epoch. 08 (3:4:1.3.1)

No.	Input Values	Desired Output Value
1	$X_1 = (1, -2, 0, -1)$	$T_1 = -1$
2	$X_2 = (0, 1.5, 0.5, -1)$	$T_2 = -1$
3	$X_3 = (-1, 1, 0.5, -1)$	$T_3 = 1$

Learning constant is assumed to be 0.1;

Initial weight vector is $W_0 = (1, -1, 0, 0.5)$

- c. Summarize the convergence factor of back propagation algorithm and explain why back propagation failed. 06 (2:1:1.3.1)

Module-4

7. a. There is a 60 % chance it will snow on Tuesday. If it snows on Tuesday, there is a 30 % chance it will snow on Wednesday. If it does not snow on Tuesday, there is a 50 % chance it will snow on Wednesday. What is the probability of snow on Wednesday? If it snowed on Wednesday, what is the probability that it snowed on Tuesday? 10 (3:4:1.3.1)

- b. Apply Naïve Bayes classifier & find the class label of the new instance X 10 (3:4:1.3.1)
(age=youth, income=medium, student=yes, credit=fair)

RID	age	income	student	credit_rating	buys_computer
1	Youth	high	no	fair	no
2	Youth	high	no	excellent	no
3	Middle	high	no	fair	yes
4	Senior	medium	no	fair	yes
5	Senior	low	yes	fair	yes
6	Senior	low	yes	excellent	no
7	Middle	low	yes	excellent	yes
8	Youth	medium	no	fair	no
9	Youth	low	yes	fair	yes
10	Senior	medium	yes	fair	yes
11	Youth	medium	yes	excellent	yes
12	Middle	medium	no	excellent	yes
13	Middle	high	yes	fair	yes
14	Senior	medium	no	excellent	no

(OR)

8. a. Apply K-NN algorithm in finding the class label of new instance 'X' 08 (3:5:1.3.1)
by using the training dataset provided below. (assume K=3)

USN	Attendance	ML Marks	Result
1	4	3	Fail
2	6	7	Pass
3	7	8	Pass
4	5	5	Fail
5	8	8	Pass
X (Attendance = 6, Marks = 8)			

- b. Summarize the working principle of non-parametric locally weighted logistic regression method. 06 (2:1:1.3.1)
- c. Explain the radial basis function network. 06 (2:1:1.3.1)

Module-5

9. a. Outline the working principle of bisecting K-means algorithm. 06 (2:1:1.3.1)
- b. Illustrate the process of reducing the SSE with post-processing. 06 (2:1:1.3.1)
- c. Differentiate between classification and clustering. 08 (2:1:1.3.1)
- (OR)
- 10 a. Explain Density Based Clustering (DBSCAN) algorithm with an example. 10 (2:1:1.3.1)
- b. Summarize different types of Graph based clustering. 10 (2:1:1.3.1)

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