

Reg. No.

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B.E / B.TECH. DEGREE EXAMINATION, MAY 2023

Third Semester

AD18403 – APPLIED MACHINE LEARNING

(Artificial Intelligence and Data Science)

(Regulation 2018 / Regulation 2018A)

TIME: 3 HOURS

MAX. MARKS: 100

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Develop an appreciation for what is involved in learning models from real world data.	2
CO 2	Use parametric methods to obtain AI based solution.	3
CO 3	Implement machine learning solutions to clustering problems.	3
CO 4	Use discriminative models to evaluate data.	3
CO 5	Apply the decision tree and mixture of experts algorithms to real-world problems.	3

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

Q.No	QUESTION	CO	RBT LEVEL
1.	What is called machine learning?	1	1
2.	Define losses and risks.	1	2
3.	What is the purpose of the maximum likelihood Estimation?	2	1
4.	Differentiate between bias and variance.	2	2
5.	Differentiate between single and complete linkage in hierarchical clustering.	3	1
6.	What do you mean by dendrogram?	3	2
7.	Differentiate between MP-Neuron and perceptron.	4	1
8.	Define the term hyperplane in SVM.	4	2
9.	Define the term bagging in random forest.	5	1
10.	What is the need of pruning process in decision tree?	5	2

PART- B (5 x 14 = 70 Marks)

Marks	CO	RBT LEVEL
(14)	1	4

11. (a) Suppose we have a dataset of **weather conditions** and corresponding target variable "**Play**". So, using this dataset we need to decide that whether we should play or not on a particular day according to the weather conditions. So, to solve this problem, we need to follow the below steps:

- Convert the given dataset into frequency tables.
- Generate Likelihood table by finding the probabilities of given features.
- Now, use Bayes theorem to calculate the posterior probability.

Problem: If the weather is sunny, then the Player should play or not?

Sl. No	Outlook	Play
1	Rainy	Yes
2	Sunny	Yes
3	Overcast	Yes
4	Overcast	Yes
5	Sunny	No
6	Rainy	Yes
7	Sunny	Yes

Sl. No	Outlook	Play
8	Overcast	Yes
9	Rainy	No
10	Sunny	No
11	Sunny	Yes
12	Rainy	No
13	Overcast	Yes
14	Overcast	Yes

(OR)

- (b) Explain about types of learning in machine learning. Consider a case study to brief about the suitability of learning with examples. (14) 1 4
12. (a) What is called bayes estimator? How to estimate the parameters using Bayesian Method. (14) 2 4
- (OR)
- (b) Discuss the importance of model selection procedure in machine learning. Give an example. (14) 2 4
13. (a) Cluster the following eight points (with (x, y) representing locations) into three clusters: (14) 3 3
A1(2, 10), A2(2, 5), A3(8, 4), A4(5, 8), A5(7, 5), A6(6, 4), A7(1, 2), A8(4, 9)
- (OR)
- (b) Compute the linear discriminant projection for the following dataset. (14) 3 3

Curvature	Diameter	Quality Control Result
2.95	6.63	Passed
2.53	7.79	Passed
3.57	5.65	Passed
3.16	5.47	Passed
2.58	4.46	Not Passed
2.16	6.22	Not Passed
3.27	3.52	Not Passed

14. (a) Explain the concepts of Logistic regression and back-propagation with suitable example. (14) 4 4
- (OR)
- (b) For the given data set compute, the expected outcome of a perceptron for the given conditions (14) 4 4
- $x_1=x_2=x_4 = 1$ and threshold ≥ 1.5
 - $x_1=x_3=x_5=1$ and threshold ≥ 1.5

Criteria	Input	Weight
Artists is Good	$x_1 = 0$ or 1	$w_1 = 0.7$
Weather is Good	$x_2 = 0$ or 1	$w_2 = 0.6$
Friend will Come	$x_3 = 0$ or 1	$w_3 = 0.5$
Food is Served	$x_4 = 0$ or 1	$w_4 = 0.3$
Alcohol is Served	$x_5 = 0$ or 1	$w_5 = 0.4$

15. (a) Consider the given dataset. Construct the decision tree and generate the rules (14) 5 4 from that.

Age	Income	Student	Credit Rating	Buys Product
Young	High	No	Fair	No
Young	High	No	Good	No
Middle	High	No	Fair	Yes
Old	Medium	No	Fair	Yes
Old	Medium	No	Fair	Yes
Old	Low	Yes	Good	No
Middle	Low	Yes	Good	Yes
Young	Medium	No	Fair	Yes
Young	Low	Yes	Fair	Yes
Old	Medium	Yes	Fair	Yes
Young	Medium	Yes	Fair	Yes
Middle	Medium	No	Good	Yes
Middle	High	Yes	Fair	Yes
Old	Medium	No	Good	No

(OR)

- (b) How random forest is different from decision tree. Justify the answer with an example. (14) 5 4

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

- | | Marks | CO | RBT LEVEL |
|--|-------|----|-----------|
| 16. Differentiate between single layer perceptron and multilayer perceptron. Discuss the merits and demerits also. | (10) | 4 | 5 |