NARULA INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT

B.TECH/CSE/ODD/SEM_8/ CS802B/2020-2021
PAPER TYPE: REGULAR/SUPPLE(R16)
YEAR: 2021

MACHINE LEARNING
CS802B

TIME ALLOTTED: 3 HOURS FULL MARKS: 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

1. Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

SL. NO.	Question	Marks
(i)	During training phase, Supervised Learning Model for classification requires (a) Dataset with class labels (b) Dataset without class labels (c) Only class labels (d) None of the above	1
(ii)	ML is a field of AI consisting of learning algorithms that? (a) Improve their performance (b) At executing some task (c) Over time with experience (d) All of the above	1
(iii)	Regression Model is based on (a) Supervised Learning (b) Unsupervised Learning (c) Reinforcement Learning (d) None of the above	1
(iv)	Association Rule Mining for Market Basket analysis is based on the concept of (a) Supervised Learning (b) Unsupervised Learning (c) Reinforcement Learning (d) None of the above	1
(v)	The Letter-Grade Score in an examination is an example of (a) Categorical and nominal variable (b) Categorical and ordinal variable (c) Discrete Quantitative variable (d) Continuous Quantitative variable	1

(vi) The model will be trained with data in one single batch is known as ? 1

(a) Batch learning
(b) Offline learning
(c) Both A and B
(d) None of the above

(vii) In Model based learning methods, an iterative process takes place on the ML models that are built based on various model parameters, called ? 1

(a) mini-batches
(b) optimizedparameters
(c) hyperparameters
(d) superparameters

(viii) K-means clustering scheme is one kind of 1
(a) Hierarchical clustering strategy
(b) Density based clustering strategy
(c) Partitioning clustering strategy
(d) None of the above

(ix) A binary sigmoid function has range of 1
(a) (-1, +1)
(b) (-1, 0)
(c) (0, 1)
(d) None of the above

(x) Which of the followings are critical aspects of ANN based learning? 1
(a) Number of layers only
(b) Number of nodes only
(c) Interconnection weights only
(d) All of the above

(xi) If the linear regression involves only more than one independent variable then it is called 1

(a) Multiple Regression
(b) Simple Regression
(c) Polynomial Regression
(d) None of the above

(xii) Which of the following is a widely used and effective machine learning algorithm based on the idea of bagging? 1

(a) Decision Tree
(b) Regression
(c) Classification
(d) Random Forest

GROUP – B*
(Short Answer Type Questions)

Answer any ***three*** from the following: **3×5=15**

SL. NO.			Marks
2.		Can you represent the following boolean function with a single logistic threshold unit (i.e., a single unit from a neural network)? If yes, show the weights. If not, explain why not in 1-2 sentences.	5

A	B	f(A,B)
1	1	0
0	0	0
1	0	1
0	1	0

3.	(a)	How can one apply ordinal along with one-hot encoding for the given temperature scale: {cold, warm, hot, very hot}?	2
	(b)	Compute accuracy, precision, recall, F-measure, sensitivity and specificity in respect of following classification model's outcome.	3

		Predicted Category	
		C_1 (+) Covid+	C_2 (−) Covid-
Actual Category	C_1 (+) Covid+	True Positive **85**	False Negative **2**
	C_2 (−) Covid-	False Positive **4**	True Negative **9**

4		Suppose we clustered a set of N data points using two different clustering algorithms: k-means and Gaussian mixtures. In both cases we obtained 5 clusters and in both cases the centers of the clusters are exactly the same. Can 3 points that are assigned to different clusters in the kmeans solution be assigned to the same cluster in the Gaussian mixture solution? If no, explain. If so, sketch an example or explain in 1-2 sentences.	5
5.	(a)	Apply the concept of regression model for the following dataset to determine the glucose level of a person having age 55.	3

AGE (X)	**GLUCOSE LEVEL (Y)**
43	99
21	65
25	79
42	75
57	87
59	81

	(b)	Compute R-square value of the regression model with respect to above dataset.	2

6 (a) How does SVM work for solving classification problem? 3

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(b) State the major advantages and disadvantages of SVM for solving classification problem. 2

GROUP – C*
(Long Answer Type Questions)

Answer any ***three*** from the following: **3×15=45**

SL. NO. **Marks**

7. (a) How does Reinforced Learning work in Machine Learning? 3

(b) Explain overfitting problem in regression analysis. 2

(c) Design a decision tree classifier based on the ID3 algorithm with respect to the following dataset and determine whether one should play tennis given outlook=sunny, humidity=high, wind=strong. 10

Day	Outlook	Humidity	Wind	Play Tennis
1	Sunny	High	Weak	No
2	Sunny	High	Strong	No
3	Overcast	High	Weak	Yes
4	Rain	High	Weak	Yes
5	Rain	Normal	Weak	Yes
6	Rain	Normal	Strong	No
7	Overcast	Normal	Strong	Yes
8	Sunny	High	Weak	No
9	Sunny	Normal	Weak	Yes
10	Rain	Normal	Weak	Yes
11	Sunny	Normal	Strong	Yes
12	Overcast	High	Strong	Yes
13	Overcast	Normal	Weak	Yes
14	Rain	High	Strong	No

8. (a) Assume we have a set of data from patients who have visited hospital during the year 2011. A set of features (e.g., temperature, height) have been also extracted for each patient. Our goal is to decide whether a new visiting patient has any of diabetes, heart disease, or Alzheimer (a patient can have one or more of these diseases). 7

We have decided to use a neural network to solve this problem. We have two choices: either to train a separate neural network for each of the diseases or to train a single neural network with one output neuron for each disease, but with a shared hidden layer. Which method do you prefer? Justify your answer.

(b) Illustrate DBSCAN clustering scheme with respect to the following dataset where it is given that the minimum number of points inside the circle around a core-point being at center is 4 and the radius of the circle is 1.9 units. 7

Point	X	Y
P1	3	7
P2	4	6
P3	5	5
P4	6	4
P5	7	3
P6	6	2
P7	7	2
P8	8	4

P9	3	3
P10	2	6
P11	3	5
P12	2	4

(c) What is the advantage of K-Medoid clustering strategy over K-Means clustering strategy? 1

9. (a) Explain the working principle of Hierarchical Divisive Clustering strategy. 3

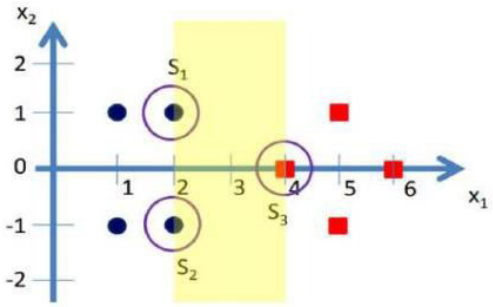
(b) Apply the concept of Hierarchical Agglomerative Clustering strategy on the following data to construct the dendogram as diagrammatic representation of the entire clustering process. 10

Point	X	Y
P1	1	1
P2	1.5	1.5
P3	5	5
P4	3	4
P5	4	4
P6	3	3.5

(c) How can we measure the quality of a cluster? 2

10. (a) Explain SVM and how it classify a dataset 3

(b) Apply SVM algorithm for the data-points and find dimension of hyper plane to classify the data-points for the figure. (assume bias =1) 5



(c) Apply the principle of apriori algorithm to generate association rules with reference to the following transaction dataset of items: A, B, C, D, E where it is assumed that the minimum support value is 3 and confidence is 75%. 7

Transaction Id	Items
1	A, B, D, E
2	A, B, C, D, E
3	A, B, C, E
4	A, B, D
5	D
6	B, D
7	A, D, E
8	B, C

11. (a) Compare ANN model's functionalities with the physiological behaviour of Biological Neuron. 2

(b) Discuss on the following Activation Functions. 3

(i) Sigmoid

(ii) ReLu

(iii) Binary Step

(c) Illustrate the back propagation algorithm for updating the ANN link-weights with reference to the following ANN schema. 10

Input: {I1 = .05, I2 = .10}, Actual Output = {O1 = .01, O2 = .99}

W1 = .15, W2 = .20, W3 = .25, W4 = .30, b1 = .35

W5= .40, W6 = .45, W7 = .50, W8 = .55, b1 = .60