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B.Tech DEGREE EXAMINATION, DECEMBER 2023

Fifth and Seventh Semester

18ECE242J - PATTERN RECOGNITION AND NEURAL NETWORKS

(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

		Marks	BL	CO
1.	Which defines type-I error in the classification of healthy and patient? (A) The person is healthy but identified as a patient. (B) The person is healthy and identified as healthy. (C) The person is a patient but identified as a patient. (D) The person is patient but identified as healthy.	1	1	1
2.	Find the classifier which is the benchmark for a classifier design. (A) Bayes classifier (B) Nearest neighbor classifier (C) discriminant classifier (D) Neural network	1	2	1
3.	Find the approach in which the discriminant function uses a recognition function. (A) Template matching (B) Neural network (C) Syntactic (D) Statistical	1	3	1
4.	What is the work of preprocessing? (A) Reduce the data dimension. (B) Selection of best feature (C) Noise is removed (D) Feature space is divided in to decision	1	2	1
5.	Identify the drawback of the non-parametric method. (A) Incapable of proving a good representation of true conditional density (B) The number of parameters in the model grows with the size of the data set (C) The density is to be determined entirely by the data. (D) Assuming a specific functional form for the density model is difficult.	1	2	2
6.	Pick the algorithm where clustering is used. (A) supervised learning (B) unsupervised learning (C) reinforcement learning (D) both unsupervised and reinforcement learning	1	2	2
7.	Calculate Manhattan distance of the data points xi=(3,4,5) and xj=(5,7,8) (A) 2 (B) 4 (C) 8 (D) 16	1	3	2
8.	Choose the method, where the distance between 2 clusters is the distance between 2 furthest data points of 2 clusters. (A) Centroid (B) Average link (C) Complete link (D) Single link	1	2	2

9.	Find the value of the of output of threshold activation function, if input to the threshold active function is more than 0. (A) 0 (B) 1 (C) 0.5 (D) -1	1	3	3
10.	Identify the learning method, also known as learning without a teacher. (A) supervised learning (B) unsupervised learning only (C) reinforcement learning only (D) both unsupervised and reinforcement learning	1	1	3
11.	Choose the learning method, in which the change in weight depend upon the value computed by subtracting the output from the desired output. (A) Error-correction learning (B) Memory-based learning (C) Hebbian learning (D) Competitive learning	1	2	3
12.	Pick the threshold value for the McCullon AND logic (A) 0 (B) 1 (C) 2 (D) -1	1	3	3
13.	Identify the architecture in which the input training vector and output target vector are not the same. (A) Auto-associative memory network (B) Hetero associative memory network (C) Hopfield network (D) Both the auto-associative memory network and Hopfield network	1	2	4
14.	Choose which technique does not have a training algorithm. (A) Auto-associative memory network (B) Hetero associative memory network (C) Hopfield network (D) Boltzmann machine	1	2	4
15.	Identify the logic gate, which is impossible to implement in the single-layer neural network. (A) AND (B) OR (C) XOR (D) NOT	1	2	4
16.	Identify the initial weight between which layers are trained in the forward-only counter propagation network after input vectors are presented to input units. (A) Input and Cluster (B) Cluster and Output (C) Input and Output (D) output and competitive layer	1	2	4
17.	Find which uses the supervised learning technique. (A) ART1 (B) ART2 (C) Fuzzy ARTMAP (D) SOM	1	2	5
18.	Find the number of nodes in the distance-2 grid of rectangular grid topology. (A) 12 (B) 24 (C) 6 (D) 18	1	2	5
19.	Identify the correct statement for ART1. (A) . It is the supervised clustering of binary input vectors (B) It is the unsupervised clustering of real-valued input vectors. (C) It is the unsupervised clustering of binary input vectors. (D) It is the supervised clustering of real-valued input vectors.	1	2	5
20.	Find the number of output layers needed for recognition digits 0 to 5 (A) 10 (B) 8 (C) 5 (D) 6	1	3	5

PART - B (5 × 4 = 20 Marks) **Marks BL CO**

Answer **any 5** Questions

21.	Write a short note on the Nearest neighbor classifier.						4	2	1
22.	Explain the agglomerative algorithm.						4	2	2
23.							4	3	2

x_1	1	1	1	1	1	0
x_2	0	1	1	1	0	1

(i) Create a confusion matrix
(ii) Calculate distance using the Jaccard coefficient, with 1 having the highest priority.

24.	Write a short note on Hebbian learning.						4	2	3
25.	Illustrate the Hebb rule with a target created by the OR logic function.						4	3	3
26.	Illustrate the architecture of RNN.						4	2	4
27.	Explain about hexagonal grid topology.						4	2	5

PART - C (5 × 12 = 60 Marks) — **Marks** **BL** **CO**

Answer **all** Questions

28. (a) 3 baskets (A, B, C) consist of mango and dragon fruit as follows: — 12 3 1

	Mango	Dragon fruit
Basket-A	40	30
Basket-B	30	15
Basket-C	30	40

Calculate conditional probability P(Basket-C| Dragon fruit).
Compute conditional probability P(Basket-B|Mango).
Find posterior probability P(Dragon fruit| Basket-A).
What will be the Bayes classifier output for basket-A and basket-B? (Class 0-Mango, Class 1- Dragon fruit).

(OR)

(b) Explain the process of classifier design with a flowchart.

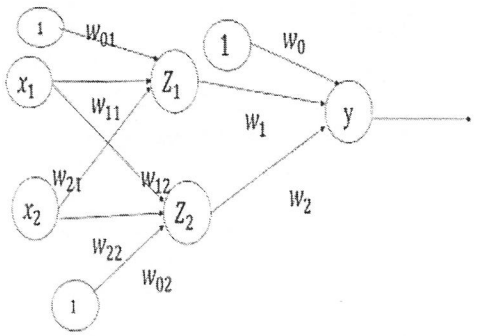
29. (a) Illustrate the K means clustering algorithm with an example. — 12 3 2

(OR)

(b) Assume we have a text collection D of 900 documents from 3 topics (or 3 classes), science, sports, and politics. Each class has 300 documents. Each document in D is labeled with one of the topics (classes). We use this collection to perform clustering to find 3 clusters. Note that class/topic labels are not used in clustering. Calculate entropy and purity for each cluster and overall cluster.

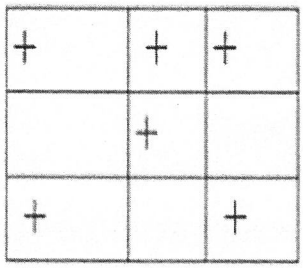
Cluster	Science	Sports	Politics
1	250	20	10
2	20	180	80
3	30	100	210
Total	300	300	300

30. (a) Calculate the new weight of the multilayer perceptron neural network. If $x_1 = 1$, $x_2 = 0$, w_{01}=0.2, $w_{02} = 0.6$, $w_{11} = 0.6$, $w_{21} = -0.2$, $w_{12} = -0.3$, $w_{22} = 0.4$, $w_0 = -0.2$, $w_1 = 0.4$, $w_2 = 0.1$. Target output=1, Learning rate=0.25, use binary sigmoid activation function. 12 3 3

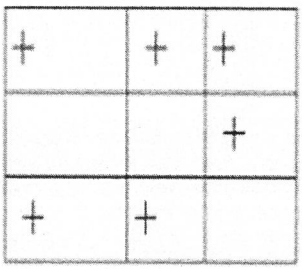


(OR)

(b) (i) Using the Hebb rule, find weights required to perform the following classification of given input pattern: + symbol represents the value 1, and empty sequence indicates -1. Consider **'I'** belongs to a member of the class has a target value 1 and **'O'** does not belong to the member of the class so has a target value of -1. Implement a manual method to calculate new weight and bias



I



O

(ii) Explain credit assignment.

31. (a) Elaborate training and testing algorithm of discrete Hopfield network 12 3 4

(OR)

(b) (i) Calculate the output and weight of an auto-associative memory network for input of [1 -1 1 -1]
(ii) Write the training and testing algorithm of auto-associative memory.

32. (a) Describe Adaptive Resonance Theory - ART2 algorithm and illustrate its architecture. 12 3 5

(OR)

(b) Summarize Kohonen SOM (KSOM) with a neat architecture diagram and training algorithm.

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