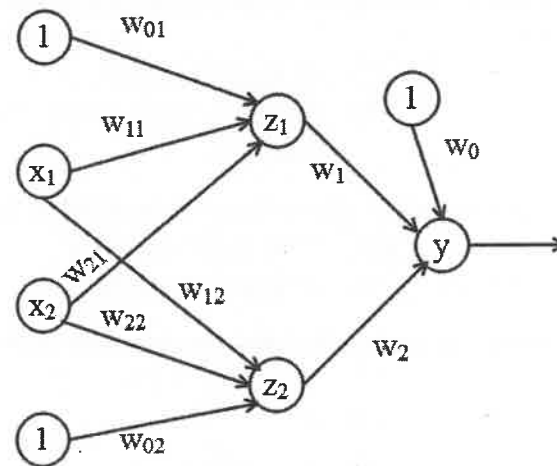(i) Compute mean and standard deviation using maximum likelihood estimation.

(ii) Calculate the normal distribution function for $X(6/\hat{\mu}\hat{\sigma})$.

28. a. Calculate the new weight of multilayer perceptron neural network. If $x_1 = 0$, $x_2 = 1$, $w_{01} = 0.4$, $w_{02} = 0.5$, $w_{11} = 0.7$, $w_2 = -0.1$, $w_{12} = -0.4$, $w_{22} = 0.4$, $w_0 = -0.2$, $w_1 = 0.4$, $w_2 = 0.1$. Target output =1. Learning rate =0.25. Use binary sigmoid activation function.   10 3 3 4

(OR)

b.i. Find weights required to perform the following classification of given input pattern using Hebb rule: +symbol represent the value 1 and empty sequence represent the value −1. 'I' belongs to member of class has target value 1, and 'O' belongs to target value −1. Implement manual method to calculate new weight and bias.   6 3 3 4

I   O
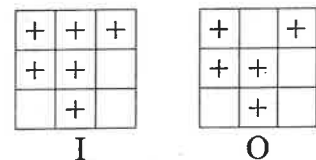
ii. Illustrate Hebb rule with target created by OR logic gate.   4 3 3 4

29. a. Explain training and testing algorithm of auto associative memory.   10 2 4 3

(OR)

b. Elaborate testing algorithm of Boltzmann machine.   10 2 4 3

30. a. Describe LVQ with a flow chart.   10 2 5 3

(OR)

b. Explain ARTI algorithm and its steps.   10 2 5 3

* * * * *

Reg. No. [   ]

B.Tech. DEGREE EXAMINATION, NOVEMBER 2022
Sixth and Seventh Semester

18ECE242J – PATTERN RECOGNITION AND NEURAL NETWORKS
(For the candidates admitted from the academic year 2018-2019 to 2019-2020)

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** should be answered in answer booklet.

Time: 2½ Hours   Max. Marks: 75

Marks BL CO PO

PART – A (25 × 1 = 25 Marks)
Answer ALL Questions

1. Identify the pattern recognition technique in which recognition function is correlation   1 1 1 1
   (A) Template matching   (B) Statistical
   (C) Neural network   (D) Structural syntactic

2. Choose the work of feature extraction stage   1 1 1 1
   (A) Segment data   (B) Reduce the data
   (C) Remove noise   (D) Divide the feature space in to decision region

3. Find the number of classes for Optical Character Recognition (OCR).   1 2 1 2
   (A) 4   (B) 10
   (C) 26   (D) 32

4. Pick the classifier which is bench marked for any classifier design   1 1 1 2
   (A) Discriminant function based classifier   (B) Bayes classifier
   (C) Linear discriminant function based classifier   (D) Nearest neighbor classifier

5. Identify the main aim of Bayes decision rule   1 1 1 2
   (A) Maximize probability error   (B) Minimize probability error
   (C) Calculated the expected loss   (D) Computation of overall risk

6. Find the drawback of non-parametric method from the following   1 1 2 4
   (A) Incapable of providing good representation of condital density   (B) The number of parameter in the model grows with size of dataset
   (C) The density of be determined entirely by the data   (D) Assuming specific functional form for density model is difficulty

7. Choose the supervised learning problem   1 1 2 4
   (A) Learning to drive using a reward model   (B) Predicting disease from blood samples
   (C) Grouping students in the same class based on similar feature   (D) Group audio files based on language of the speakers

8. Identify the reason to compute radius and standard deviation of cluster   1 1 2 4
   (A) To determine spread in each dimension   (B) Find centroid
   (C) To make cluster more accurate   (D) To merge the cluster

9. Find manhattan distance of data points X_I and X_J 1   2   2   4
   - (A) $|X_I - X_J|$
   - (B) $\sqrt{(X_I - X_J)^2}$
   - (C) $\dfrac{X_I}{X_J}$
   - (D) $X_I + X_J$

10. Pick the method, in which distance between 2 cluster is distance between 2 closest data points in the 2 clusters   1   1   2   4
    - (A) Single link method
    - (B) Complete link method
    - (C) Average link method
    - (D) Centroid method

11. Identify the learning rule which uses optimum filtering   1   1   3   4
    - (A) Memory based learning
    - (B) Hebbian learning
    - (C) Error correction learning
    - (D) Boltzmann learning

12. Pick the value of the output of threshold activation function, if input to the threshold activation function is more than 0 and threshold value is zero   1   1   3   4
    - (A) 0
    - (B) 1
    - (C) −1
    - (D) 2

13. Find the learning method which is also known as learning with a teacher?   1   1   3   1
    - (A) Supervised learning
    - (B) Unsupervised learning
    - (C) Reinforcement learning
    - (D) Both unsupervised and reinforcement learning

14. Pick the threshold value of Mcculloh PITT neuron or function   1   1   3   4
    - (A) 0
    - (B) 1
    - (C) 2
    - (D) −1

15. Identify the logic gate which is not linearly separable   1   1   3   4
    - (A) AND
    - (B) OR
    - (C) XOR
    - (D) AND-NOT

16. Identify the architecture in which input training vector and output target vector are not same   1   1   4   3
    - (A) Auto associative memory network
    - (B) Hetero associative memory network
    - (C) Hopfield network
    - (D) Both auto associative and hopfield network

17. Pick the architecture for which connection is between hidden layer   1   1   4   3
    - (A) Single layer neural network
    - (B) Adaptive linear neural network
    - (C) Recurrent neural network
    - (D) Multi-layer neural network

18. Find the number of neurons present in bidirectional associative memory   1   1   4   3
    - (A) 2
    - (B) 3
    - (C) 4
    - (D) 5

19. Identify which architecture does not has training algorithm   1   1   4   3
    - (A) Hopfield network
    - (B) Auto associative memory network
    - (C) Hetero associative memory network
    - (D) Boltzmann machine

20. Pick the property which does not belong to Hopfield network   1   1   4   3
    - (A) It has one inverting and one non-inverting input
    - (B) It has no self connection
    - (C) Weight should be symmetrical
    - (D) It has self connection

21. Find the technique which uses supervised learning technique   1   1   5   3
    - (A) ART1
    - (B) ART 2
    - (C) Fuzzy ART Map
    - (D) SOM

22. Choose number of nodes present in the distance – 2 grid of hexagonal grid topology   1   2   5   3
    - (A) 24
    - (B) 18
    - (C) 12
    - (D) 6

23. Identify the method of feature selection, which is independent of any machine learning algorithms   1   1   5   3
    - (A) Filter methods
    - (B) Warper methods
    - (C) Embedded methods
    - (D) Both warper and embedded method

24. Pick which is not possible for low value of vigilance threshold in ART 1   1   1   5   3
    - (A) Large mismatch accepted
    - (B) Few large clusters
    - (C) Misclassification more likely
    - (D) Higher precision

25. Calculate the number of output layers needed for recognition of digits 0 to 5   1   2   5   3
    - (A) 10
    - (B) 8
    - (C) 6
    - (D) 5

PART – B (5 × 10 = 50 Marks)
Answer ALL Questions

	Marks	BL	CO	PO

26. a. Three baskets (A,B,C) consist of mango and orange as follows: 10   3   1   1

Basket	Mango	Orange
A	20	25
B	30	15
C	30	35

   - (i) Calculate conditional probability P(Basket-C/Orange)
   - (ii) Compute conditional probability P(Basket-B/Mango)
   - (iii) Find the posterior probability P(orange/Basket-A)
   - (iv) What will be the Bayes classifier output for Basket –A and Basket-B (class-0-mango, class-1-orange).

(OR)

   b. Illustrate the minimax criteria by describing minimization of the maximum possible overall risk with the help of two category classification example.   10   3   1   2

27. a. Write K-means algorithm with example.   10   3   2   4

(OR)

   b. For the one dimensional dataset   10   3   2   4

$$X = \begin{bmatrix} 12 \\ 14 \\ 8 \\ 1 \\ 9 \\ 6 \\ 3 \\ 2 \\ 7 \end{bmatrix}$$