HSNC UNIVERSITY, MUMBAI

KISHINCHAND CHELLARAM COLLEGE

DEPT. OF COMPUTER SCIENCE

MSc CS SEM. I (2020-21) SOFT COMPUTING (SLE) PRESENTATION QUESTIONS

Group 1: Sourav, Hruturaj	**Q.25, Q.26**
Group 2: Prathamesh, Bharat, Aryan, Himanshu	**Q.1, Q.8, Q.13, Q.19**
Group 3: Tanay, Pavan, Rohan, Ansh	**Q.2, Q.9, Q.14, Q.20**
Group 4: Sachin, Rahul, Sumit, Hasan	**Q.3, Q.10, Q.15, Q.21**
Group 5: Reena, Hemant, Prachi, Abhishek	**Q.4, Q.11, Q.16, Q.22**
Group 6: Anand, Mahmood, Kaustubh, Abufazal	**Q.5, Q.12, Q.17, Q.23**
Group 7: Nandini, Anupama, Priyanka, Sharmeen	**Q.6, Q.7, Q.18, Q.24**

Q.1. State the working of McCulloch Pitts Neuron. Can any Boolean function be represented using a McCulloch Pitts unit? Comment on the statement "A single McCulloch Pitts Neuron can be used to represent Boolean functions which are linearly separable". Use multiple examples to justify the given statements.

Q.2. What is the need of classical perceptron model? State its working and features.

Q.3. What kind of functions can be implemented using the perceptron? Any difference from McCulloch Pitts neurons?

Q.4. How many Boolean functions can you design from 2 inputs?
Of these, how many are linearly separable? In general, how many Boolean functions can you have for n inputs?

Q.5. Multi-layer Perceptron: Power of a Network of Perceptrons: how to implement any Boolean function using a network of perceptrons?

Q.6. What is associative memory network all about? Discuss about Auto-associative and hetero-associative memory networks and its applications.

Q.7. Discuss the most fundamental unit of deep neural network. Why is it called a neuron? Where does the inspiration come from?

Q.8. Using back-propagation network, find the new weights for the network shown in the following figure. The network is presented with the input pattern [1, 0] and the target output 1. Use learning rate of $\alpha = 0.3$ and binary sigmoidal activation function.

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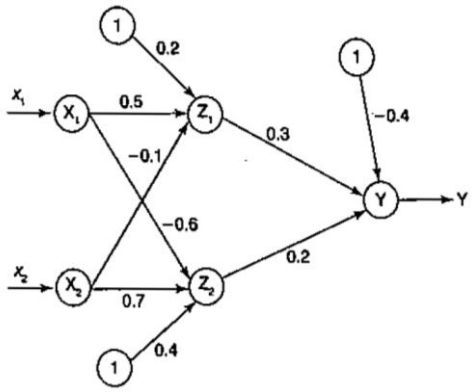

Q.9. (a) Find the weight matrix in bipolar form for the bidirectional associative memory using outer products rule for the following binary input-output vector pairs:

s(1) = (1, 0, 0, 0), t(1) = (1, 0)

s(2) = (1, 0, 0, 1), t(2) = (1, 0)

s(3) = (0, 1, 0, 0), t(3) = (0, 1)

s(4) = (0, 1, 1, 0), t(4) = (0, 1)

(b) Using unit step function (with threshold 0) as the output units activation function, test the response of the network on each of the input patterns.

(c) Test the response of the network on various combinations of input patterns with mistakes or missing data. **(i)** [1, 0, -1, -1] **(ii)** [-1, 0, 0, -1] **(iii)** [-1, 1, 0, -1] **(iv)** [1, 1, -1, -1] **(v)** [1, 1]

Q.10. State Hebbian Learning Rule Algorithm. Implement Hebbian Learning Rule to train XOR function with bipolar inputs and targets.

Q.11. Implement Hebbian Learning Rule to Find the Weights Required to Perform the Following Classifications. Vectors (1 1 1 1) and (−1 1 −1 −1) Are Members of Class (with Target Value 1); Vectors (1 1 1 −1) and (1 −1 −1 1) Are Not Members of Class (with Target Value −1)

Q.12. Implement Hebbian Learning rule to classify two dimensional input patterns.

Q.13. What is the use of activation function? Implement Activation Functions That Are Used in Neural Networks: **(a)** Identity Function, **(b)** Binary Step Function with Threshold Value 1 and 0, **(c)** Binary Sigmoid Function, and **(d)** Bipolar Sigmoid Function.

Q.14. Write a Program if the Net Input to an Output Neuron Is 0.38, Calculate Its Output When the Activation Function Is **(a)** Binary Sigmoid Function and **(b)** Bipolar Sigmoid Function

Q.15. Write a Program to Generate Output for OR Function Using McCulloch–Pitts Neurons with Threshold Value 1.

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Q.16. Write a Program to Generate the Output of Logic AND Function by McCulloch–Pitts Neuron Model. The Threshold on Unit Is 2.

Q.17. Discuss the role of each of the following in Artificial Neural Network:

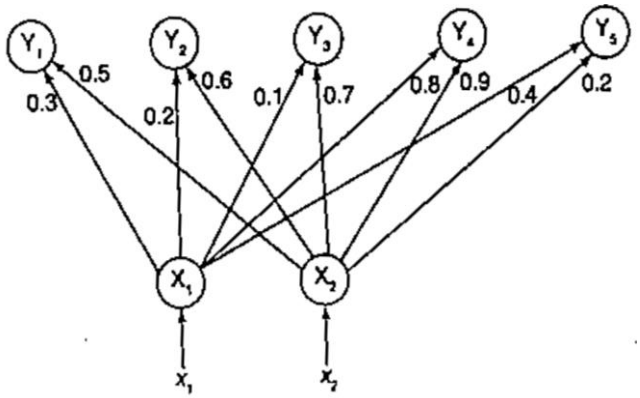
(a) Neuron **(b)** Activation function **(c)** Weights **(d)** Bias **(e)** Threshold **(f)** Epochs **(g)** Learning rate **(h)** Input/Output/Hidden layer.

Q.18. What is winner-takes-all or clustering principle or competitive learning? How is competition performed for clustering of the vectors?

Q.19. Construct a Kohenon self-organizing map to cluster the four given vectors [0, 0, 1, 1], [1, 0, 0, 0], [0, 1, 1, 0] and [0, 0, 0, 1]. The number of clusters formed is two. Assume initial learning rate of 0.5.

Q.20.

For a given Kohonen self-organizing feature map with weights shown in Figure 4: (a) Use the square of the Euclidean distance to find the cluster unit Y_j closest to the input vector (0.2, 0.4). Using a learning rate of 0.2, find the new weights for unit Y_j. (b) For the input vector (0.6, 0.6) with learning rate 0.1, find the winning cluster unit and its new weights.



Q.21. What is the purpose of LVQ net? Discuss with example how LVQ nets are trained.

Q.22. Write algorithm for MAXNET Clustering. Give one example.

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Q.23.

Consider a Kohonen self-organizing net with two cluster units and five input units. The weight vectors for the cluster units are given by

$$w_1 = [1.0\ 0.9\ 0.7\ 0.5\ 0.3]$$
$$w_2 = [0.3\ 0.5\ 0.7\ 0.9\ 1.0]$$

Use the square of the Euclidean distance to find the winning cluster unit for the input pattern $x = [0.0\ 0.5\ 1.0\ 0.5\ 0.0]$. Using a learning rate of 0.25, find the new weights for the winning unit.

Q.24. Neural Network Architectures.

- Single layer Feed Forward ANNs

- Multilayer Feed forward ANNs

- Competitive Network

- Recurrent Networks

Q.25. What is soft computing? State its characteristics. Discuss in brief about the principal components of soft computing.

Q.26. Learning by Neural Nets. (Refer topic 6.7 from Book- Samir Roy)