

Indian Statistical Institute

Semester Examination: 2021 – 2022

Master of Science in Quality Management Science, Semester II

Compulsory Optional: Neural Networks

Date: 16 May 2022

Maximum Marks: 100

Duration: 3 hours

Attempt all the questions. Credit will be given for precise and brief answers.

1. Describe the k-means clustering algorithm and the k nearest neighbor algorithm. Mention two important differences between them. For a given k and on same size data which one will take more time to execute and why? $5 + 5 + 2 + 4 = 16$
2. (a) Name an unsupervised neural network. Explain why is it unsupervised? $2 + 6 = 8$
(b) What is competitive learning? Choose a network to explain. You may draw the architecture and describe the competitive learning part of the training algorithm. 8
3. Draw the architecture of an Adaptive Resonance Theory (ART) neural network. Indicate where in the architecture the short-term and long-term memories reside. Explain why are they called short-term and long-term memory. $8 + 2 + 2 + 2 + 2 = 16$
4. Draw the architecture of a Probabilistic Neural Network (PNN). Indicate cluster of nodes mapping onto the single output nodes. PNNs are stated to be optimum classifier – explain. $8 + 2 + 6 = 16$
5. Why kernel technique is employed in machine learning? How many nodes should be there in the hidden layer of a Radial Basis Function (RBF) network? Describe a technique or algorithm to reduce that number. What function does an RBF network approximate and how? Drawing a diagram might be helpful for explanation. $2 + 2 + 4 + 2 + 6 = 16$
6. Write a short note on any two of the following: (1) Evolutionary computation; (2) Artificial immune systems; (3) Fuzzy systems; (4) Swarm intelligence. $10 + 10 = 20$