

MASTER OF COMPUTER SCIENCE & ENGINEERING 2nd SEMESTER EXAMINATION 2019

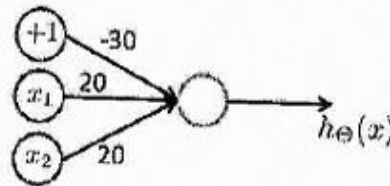
SOFT COMPUTING

Time: Three Hours

Full Marks: 100

Answer any Five Questions

1. a) What is "Soft Computing"? What is the aim of soft computing? How does it differ from *Hard Computing*? (4+2+4) (4)
- b) As far as information processing is concerned, why is computer far behind the human being? (4)
- c) "Soft Computing Approach attempts to find an **approximate solution** to a precisely/ imprecisely formulated problem"- Justify this statement with suitable examples. (6)
2. a) Consider the following neural network which takes two binary valued inputs $x_1, x_2 \in \{0,1\}$, threshold transfer function $h_\theta(x)$. Which logical function does it (approximately) compute? Explain your answer. (3)



- b) Describe Delta rule of learning for single layer perceptron. (5)
- c) Discuss on major drawbacks of Perceptron training algorithm and its possible remedies. (6)
- d) Discuss on the disadvantages of back-propagation learning algorithm and its possible remedies. (6)
- 3.a) Consider the network in Figure 1. What type of neural network is it? Discuss. (4)

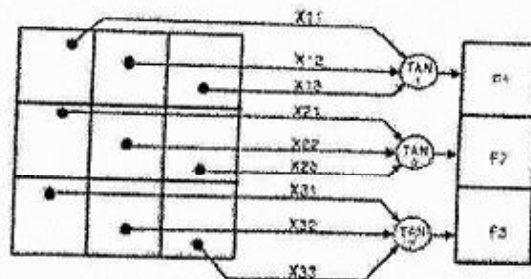


Figure 1

- b) How does the performance of an MLP vary with the variation of the following factors?(4)
- i) Threshold value of a neuron
 - ii) Number of epochs
- c) Discuss on sequential learning and batch learning and comment on the corresponding performance. (6)
- d) Why does overfitting occur in ANN? How does it affect accuracy of classification? (6)
4. a) Describe the working principle of Kohonen's Self Organizing Feature Map (SOFM) Neural Network. Why is this neural network said to have "Self organization" capability? (6+4)
- b) Describe the architecture of Hopfield's model of neural network. (6)
- c) Discuss on the major difference between MLP and Kohonen model of NN. (4)
5. a) Write down the major functional differences between various types of evolutionary computing techniques. (4)
- b) What will be the impact on the performance of Genetic Algorithm (GA), if no mutation operator is used? (4)
- c) Derive Schema Theorem. (6)
- d) Discuss on encoding technique and genetic operators used for handling Travelling Salesman problem using GA. (6)
6. a) What is the role of selection procedure in Genetic Algorithm (GA)? (4)
- b) How the resolution of a solution is controlled in GA? Give suitable example in support of your answer. (6)
- c) Write down the advantages of GA over other search and optimization procedures. (4)
- d) What is elitism? (2)
- e) How do you handle the generation of infeasible solution while solving 0/1 Knapsack problem using GAs? (4)
7. a) Define fuzzy set. Compare fuzzy set and crisp set. (2+4)
- b) What is fuzzy singleton? (3)

c) The membership function distribution of a fuzzy set is assumed to follow a Gaussian distribution with mean $\mu=100$ and standard deviation $\sigma = 20$. Determine 0.6-cut of this distribution. (5)

d) When is a fuzzy set said to be subnormal? How can you make it normal? (4)

e) Why the law of excluded middle does not hold true in fuzzy logic? (2)

8. a) For two fuzzy sets

$$A = \{0.2/LS, 0.5/MS, 0.7/HS\}$$

$$B = \{0.1/PE, 0.55/ZE, 0.85/NE\}$$

Find: $R = A \times B$

Introducing a fuzzy set C given by

$$C = \{0.25/LS, 0.5/MS, 0.75/HS\}$$

Find: $S = B \times C$

Find: $C \circ R$ using max-min composition. (3+3+4)

b) Describe a way of integrating the three components of soft computing techniques for an image processing task. (10)