Code :R7420302 **1**

IV B.Tech II Semester(R07) Regular Examinations, April 2011
NEURAL NETWORKS & FUZZY LOGIC SYSTEMS
(Mechanical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. (a) What are the different models of artificial neuron? Explain them in detail.
   (b) Discuss characteristics of ANN and potential applications of ANN.
2. (a) Explain in detail the different artificial neural network architectures.
   (b) Explain about different learning rules of Neural networks.
3. (a) State and prove perceptron convergence theorem.
   (b) Explain why a single layer perceptron cannot be used to solve linearly non-separable problems. Give two examples of binearly non-separable problems.
4. What is back propagation? Derive its learning algorithm with a schematic two layer feed forward neural network.
5. (a) What are the models of operation of a Hopfield network?
   (b) Explain the algorithm for storage of information in a Hopfield network. Similarly explain the recall algorithm.
6. (a) Explain in detail different membership functions of fuzzy logic system.
   (b) Explain about different properties and operations of fuzzy sets.
7. Write short notes on the following:
   (a) Knowledge base is fuzzy logic control system.
   (b) Decision making logic in fuzzy logic control system.
8. Explain how fuzzy logic controller is designed for classification problem.

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Code :R7420302 **2**

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(Mechanical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Explain organization of brain and spiking neuron model.
   (b) Compare and contrast artificial neural networks with conventional computer system.
2. (a) Explain in detail about different activation functions of neural networks.
   (b) Distinguish between supervised and unsupervised learning.
3. (a) Explain training algorithm of Discrete perceptron network.
   (b) Explain in detail the limitations of perceptron model.
4. (a) Derive the equation for weight change in the output and hidden layers of backpropagation network.
   (b) Explain in detail the limitations of backpropagation network.
5. (a) Explain in detail the concept of associative memories.
   (b) Explain the energy analysis of Discrete Hopfield network.
6. Let $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, determine the cardinalities and relative cardinalities of the following fuzzy sets.
   (a) $A = \{(3, 1)(4, 0.2)(5, 0.3)(6, 0.4)(7, 0.6)(8, 0.8)(10, 1)(12, 0.8)(14, 0.6)\}$
   (b) $B = \{(2, 0.4)(3, 0.6)(4.0.8)(5, 1)(6, 0.8)(7, 0.6)(8, 0.4)\}$
   (c) $C = \{(2, 0.4)(4, 0.8)(5, 1)(7, 0.6)\}$
7. (a) Explain different defuzzification methods.
   (b) Explain development of rule base and decision making system.
8. Explain the step-by-step procedure in designing of a fuzzy logic controller.

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Code :R7420302 **3**

IV B.Tech II Semester(R07) Regular Examinations, April 2011
NEURAL NETWORKS & FUZZY LOGIC SYSTEMS
(Mechanical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. (a) What is Meculloch pitts neuron model? Design Mcculloch pitts model for 'NAND' gate and 'NOR' gate.
   (b) Compare Artificial neural network and biological neural network.
2. (a) Explain in detail classification taxonomy of artificial neural networks.
   (b) Explain the architectures of single layer and multilayer artificial neural networks.
3. (a) Explain training algorithm of continuous perceptron network.
   (b) Explain in detail the limitations of perceptron model.
4. With suitable diagram derive the weight update equations in backpropagation algorithm for a multilayer feed forward neural network and explain the effect of learning rate and momentum terms in weight update equations.
5. (a) Explain the stability analysis of continuous Hopfield network.
   (b) Explain the storage and recall algorithms of associative memories.
6. (a) Explain properties, operations and relations of fuzzy sets.
   (b) Discuss membership functions and uncertainity of fuzzy sets.
7. What are the main components of fuzzy logic system? Explain each of them in detail.
8. Explain how 'ANN' is used for process identification.

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Code :R7420302 4

IV B.Tech II Semester(R07) Regular Examinations, April 2011
NEURAL NETWORKS & FUZZY LOGIC SYSTEMS
(Mechanical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Explain the concept of biological neuron model and the organization of the brain.
   (b) Realize 'AND' gate and 'OR' gate using Mcculloch-pits neutron model.
2. (a) What is meant by learning? Explain about different unsupervised learning mechanisms.
   (b) Consider the set of input vectors.
   $X_1 = \begin{bmatrix} 1 \\ -2 \\ 0 \\ -1 \end{bmatrix}, X_2 = \begin{bmatrix} 0 \\ 1.5 \\ -0.5 \\ -1 \end{bmatrix}, X_3 = \begin{bmatrix} -1 \\ 1 \\ 0.5 \\ -1 \end{bmatrix}$
   and the initial weight vector: $W^1 = \begin{bmatrix} 1 \\ -1 \\ 0 \\ 0.5 \end{bmatrix}$
   the learning constant: C=0.1, the desired responses for X_1,X_2, and X_3 are $d_1 = -1, d_2 = -1$ and $d_3 = 1$ respectively. Find the weight vectors for one cycle of training for three input vectos.
3. Explain in detail about continuous and discrete perceptron training algorithms.
4. (a) What is a generalized delta rule? Explain the role of generalized delta rule in the back-propagation training algorithm.
   (b) Discuss about learning difficulties and improvements of back propagation algorithm.
5. (a) Explain 'BAM' training algorithm with neat sketch.
   (b) State and prove 'BAM' stability theorem.
6. (a) Let $X = \{1, 2, ...10\}$, determine union and intersection of fuzzy sets 'A' and 'B'.
   $A = \{(4, 0.1)(6, 0.3)(8, 0.6)(10, 1)\}$
   $B = \{(1, 0.3)(2, 0.6)(4, 1)(6, 1)(8, 0.6)(10, 0.3)\}$
   (b) if $A = \frac{0.5}{3} + \frac{1}{5} + \frac{0.6}{7}$ and $B = \frac{0.3}{3} + \frac{0.6}{5}$ determine bounded sum of two fuzzy sets 'A' and 'B'
7. Write short notes on:
   (a) Fuzzification interface
   (b) Knowledge base
   (c) Defuzzification
8. Describe the design of fuzzylogic control with a case study.

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