Code No: RR420507 **Set No. 1**

**IV B.Tech II Semester Supplimentary Examinations, May 2008**
**NEURAL NETWORKS**
**( Common to Computer Science & Engineering and Electronics & Computer Engineering)**

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

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Explain about biological neuron with neat diagram ? [3+3]
   (b) Explain in detail the properties of biological neuron. [4]
   (c) Compare: biological neuron and Artificial neuron ? [6]
2. Compare the similarities and differences between single layer and multi layer perceptrons and also discuss in what aspects multi layer perceptrons are advantageous over single layer perceptrons. [6+6+4]
3. Explain about the generalized delta- rule and derive the weight updatation for a multi layer feed forward neural network. [8+8]
4. Describe the Hopfield model. In this model why is the energy of the all zero state always '0' in any net of any size? Use this fact to argue that at least one threshold must be negative for the all-zero state not to be stabilize well. [4+4+8]
5. Discuss how the "Winner-Take-All" in the Kohonen's layer is implemented and explain the architecture, Also explain the training algorithm. [16]
6. Explain the operation of counter propagation with suitable network model and give the equations for training. [16]
7. Explain the major phases involved in the ART classification process. [16]
8. Explain the neural network architecture used for recognition of hand written characters/digits. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR420507 **Set No. 2**

**IV B.Tech II Semester Supplimentary Examinations, May 2008**
**NEURAL NETWORKS**
**( Common to Computer Science & Engineering and Electronics & Computer Engineering)**

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

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. Discuss the operation of single neuron system. A neuron j receives inputs from four other neurons whose activity levels are 10, -20, 4 and -2. The respective synaptic weights of the neuron j are 0.8, 0.2, -1.0, and -0.9. Calculate the output of neuron j for the following two situations: [8+8]

   (a) The neuron is linear.

   (b) The neuron is represented by a McCulloch-Pitts model.

   Assume that the bias applied to the neuron is zero.

2. State and prove the perceptron convergence theorem. [2+14]

3. (a) Briefly explain the following:

      i. Task with backpropagation network. [3]

      ii. Limitations of backpropagation. [2]

      iii. Extensions of backpropagation. [3]

   (b) Explain about the performance of the back propagation learning algorithm. [8]

4. (a) What are the limitations of Hopfield network? Suggest methods that may overcome these limitations. [4+4]

   (b) A Hopfield network made up of five neurons, which is required to store the following three fundamental memories: [8]

   $$\xi_1 = [+1, +1, +1, +1, +1]^T$$
   $$\xi_2 = [+1, -1, -1, +1, -1]^T$$
   $$\xi_3 = [-1, +1, -1, +1, +1]^T$$

   Evaluate the 5-by-5 synaptic weight matrix of the network.

5. Explain the Kohonen's method of unsupervised learning. Discuss any example as its application. [8+8]

6. Derive expressions for the weight updation involved in counter propagation. [16]

7. (a) ART network exploits in full one of the inherent advantages of neural computing technique, namely parallel processing - Explain. [8]

   (b) Describe the architecture and operation of ART2 network. [3+5]

8. What are the applications of Kohonen's networks in image processing and pattern recognition? [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR420507 **Set No. 3**

**IV B.Tech II Semester Supplimentary Examinations, May 2008**
**NEURAL NETWORKS**
**( Common to Computer Science & Engineering and Electronics & Computer Engineering)**

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

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. Explain the significance of the following with reference to the biological neuron and relate them with an artificial neuron.
   (a) Axon [4]
   (b) Synaptic junction [4]
   (c) Excitatory Signals [4]
   (d) Inhibitory signals. [4]
2. Compare the similarities and differences between single layer and multi layer perceptrons and also discuss in what aspects multi layer perceptrons are advantageous over single layer perceptrons. [6+6+4]
3. (a) Briefly explain the following:
      i. Task with backpropagation network. [3]
      ii. Limitations of backpropagation. [2]
      iii. Extensions of backpropagation. [3]
   (b) Explain about the performance of the back propagation learning algorithm. [8]
4. (a) What are the limitations of Hopfield network? Suggest methods that may overcome these limitations. [4+4]
   (b) A Hopfield network made up of five neurons, which is required to store the following three fundamental memories: [8]

   $\xi_1 = [+1, +1, +1, +1, +1]^T$
   $\xi_2 = [+1, -1, -1, +1, -1]^T$
   $\xi_3 = [-1, +1, -1, +1, +1]^T$

   Evaluate the 5-by-5 synaptic weight matrix of the network.
5. Discuss how the "Winner-Take-All" in the Kohonen's layer is implemented and explain the architecture, Also explain the training algorithm. [16]
6. Write note on the following.
   (a) Bidirectional Associate memories [8]
   (b) Grossberg layer. [8]

7. Draw the architectural diagram of ART network and explain the function of each block in detail. [4+12]

8. What are the applications of Kohonen's networks in image processing and pattern recognition? [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR420507 **Set No. 4**

**IV B.Tech II Semester Supplimentary Examinations, May 2008**
**NEURAL NETWORKS**
**( Common to Computer Science & Engineering and Electronics & Computer Engineering)**

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

**Answer any FIVE Questions**
**All Questions carry equal marks**

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Give a brief description of neural networks as optimizing networks. [8]
   (b) Explain the use of ANNs for clustering and feature detection. [4+4]
2. Compare the similarities and differences between single layer and multi layer perceptrons and also discuss in what aspects multi layer perceptrons are advantageous over single layer perceptrons. [6+6+4]
3. Explain the backpropagation algorithm and derive the expressions for weight update relations? [8+8]
4. Show that the energy function of a Hopfield network may be expressed as
   $E = -\frac{N}{2}\sum_{v=1}^{M} m_v^2$
   where $m_v$ denotes overlaps defined by
   $m_v = \frac{1}{N}\sum_{j=1}^{N} x_j \xi_{v,j}, v = 1, 2, .....M$
   where $x_j$ is the $j'th$ element of the state vector x, $\xi_{v,j}$ is the $j^{th}$ element of the fundamental memory $\xi_v$ , and M is the number of fundamental memories. Prove that the above energy function is a Lypunov function. [16]
5. Explain the Kohonen's method of unsupervised learning. Discuss any example as its application. [8+8]
6. Derive expressions for the weight updation involved in counter propagation. [16]
7. (a) ART network exploits in full one of the inherent advantages of neural computing technique, namely parallel processing - Explain. [8]
   (b) Describe the architecture and operation of ART2 network. [3+5]
8. Describe how a neural network may be trained for a pattern recognition task. Illustrate with an example [16]

⋆ ⋆ ⋆ ⋆ ⋆