$\boxed{\textbf{Set No. 1}}$

**IV B.Tech II Semester Regular Examinations, Apr/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. 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) In a feed forward network, the error is the target value minus the actual value produced by the network. Suppose the target value is a range (interval) rather than a point, derive a simple scheme to calculate the error. [8]

   (b) Discuss briefly about the limitations of backpropagation and also discuss how to use the backpropagation network as a noise filter in signal processing. [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. (a) What is the Kohonen layer architure and explain its features. [4+4]

   (b) Explain the Kohonen's learning algorithm. [4+4]

6. Explain the architecture of the Grossberg layer and its training algorithm [8+8]

7. Give a detailed note on the following:

   (a) ART1 data structures. [8]

(b) ART2 simulation. [8]

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

$\star\,\star\,\star\,\star\,\star$

$\boxed{\textbf{Set No. 2}}$

**IV B.Tech II Semester Regular Examinations, Apr/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. What are multilayer ANNs? Draw the structure of a multilayer ANN and identify the salient characteristics and advantages. [3+5+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. (a) Explain why is it preferable to have different values of $\eta$ for weights leading to the units in different layers in a feed forward neural network. [8]

   (b) Discuss a few tasks that can be performed by a backpropagation 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. (a) What is the Kohonen layer architure and explain its features. [4+4]

   (b) Explain the Kohonen's learning algorithm. [4+4]

6. (a) Explain briefly about the counter propagation-training algorithm. [10]

   (b) Explain the various applications of counter propagation. [6]

7. (a) What are the advantages of ART network. Discuss about gain control in ART network. [3+5]

   (b) Discuss in detail about orienting subsystem in an ART network. [8]

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

⋆ ⋆ ⋆ ⋆ ⋆

# Set No. 3

**IV B.Tech II Semester Regular Examinations, Apr/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. What is meant by an activation function in an artificial neuron model. Describe the various activation functions that are employed and compare their merits and demerits.                                                                    [4+8+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) In a feed forward network, the error is the target value minus the actual value produced by the network. Suppose the target value is a range (interval) rather than a point, derive a simple scheme to calculate the error.            [8]

   (b) Discuss briefly about the limitations of backpropagation and also discuss how to use the backpropagation network as a noise filter in signal processing.   [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. (a) What is the Kohonen layer architure and explain its features.             [4+4]

   (b) Explain the Kohonen's learning algorithm.                                [4+4]

6. Using suitable diagrams and equations explain the basic Bidirectional Associative Memory configuration. Also describe its energy function.                        [4+6+6]

7. (a) What are the advantages of ART network. Discuss about gain control in ART network.                                                                        [3+5]

   (b) Discuss in detail about orienting subsystem in an ART network.           [8]

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

⋆ ⋆ ⋆ ⋆ ⋆

# Set No. 4

**IV B.Tech II Semester Regular Examinations, Apr/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. What is meant by an activation function in an artificial neuron model. Describe the various activation functions that are employed and compare their merits and demerits.                                                                    [4+8+4]

2. Briefly discuss about linear separability and the solution for EX-OR problem.Also suggest a network that can solve EX-OR problem.                           [4+6+6]

3. Explain the backpropagation algorithm and derive the expressions for weight update relations?                                                                 [8+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. Using suitable diagrams and equations explain the basic Bidirectional Associative Memory configuration. Also describe its energy function.                   [4+6+6]

7. What is the function of ART network and explain its operation with relevant equations.                                                                       [4+12]

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

⋆ ⋆ ⋆ ⋆ ⋆