

**IV B.Tech II Semester Regular Examinations, Apr/May 2006**  
**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 activation function? An odd sigmoid function is defined by  $\phi(V) = \tanh(av/2)$  where  $\tanh$  denotes the hyperbolic tangent. [2]
  - (a) What are the limiting values of this function? [3]
  - (b) Find the derivative of  $\phi(v)$  with respect to  $v$ . [3]
  - (c) What is the value of this derivative at the origin? [3]
  - (d) Suppose that the shape parameter  $a$  is made infinitely large. What is the resulting form of  $\phi(v)$ ? [5]
2. (a) Describe perceptron and explain about its working principle in detail. [2+6]  
 (b) Explain the limitations of perceptron? [8]
3. Generalize the XOR problem to a parity problem for  $N(>2)$  variables by considering a network for the two variables first and then extending the network considering the output of the first network as one variable and the third variable as another. Repeat this for  $n=4$  and design a network for solving the parity problem for 4 variables. [8+8]
4. What are the modes of operation of a Hopfield network? Explain the algorithm for storage of information in a Hopfield network. Similarly explain the recall algorithm. [4+8+4]
5. (a) Explain the architecture and training of Kohonen's self-organizing network. [3+5]  
 (b) Explain the Kohomem's learning algorithm. [8]
6. Explain the bidirectional associative memories using suitable examples for storage algorithms. [4x4]
7. Give a detailed note on the following:
  - (a) ART1 data structures. [8]
  - (b) ART2 simulation. [8]
8. Describe how a neural network may be trained for a pattern recognition task. Illustrate with an example [16]

\*\*\*\*\*

**IV B.Tech II Semester Regular Examinations, Apr/May 2006**  
**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) Consider a multilayer feed forward network, all the neurons of which operate in their linear regions. Justify the statement that such a network is equivalent to a single layer feed forward network. [8]  
 (b) What is the advantage of having hidden layers in an ANN? On what basis is the number of hidden layers and the number of neurons in each hidden layer selected? [3+5]
2. (a) Describe perceptron and explain about its working principle in detail. [2+6]  
 (b) Explain the limitations of perceptron? [8]
3. Implement a backpropagation algorithm to solve EX-OR problem and try the architecture in which there is a hidden layer with three hidden units and the network is fully connected. [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  

$$m_v = \frac{1}{N} \sum_{j=1}^N x_j \xi_{v,j}, v = 1, 2, \dots, M$$
 where  $x_j$  is the  $j'$ th element of the state vector  $\mathbf{x}$ ,  $\xi_{v,j}$  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. (a) What is the Kohonen layer architure and explain its features. [4+4]  
 (b) Explain the Kohonen's learning algorithm. [4+4]
6. Derive expressions for the weight updation involved in counter propagation. [16]
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. Describe how a neural network may be trained for a pattern recognition task. Illustrate with an example [16]

\*\*\*\*\*

**IV B.Tech II Semester Regular Examinations, Apr/May 2006**  
**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. 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 about the generalized delta- rule and derive the weight updation for a multi layer feed forward neural network. [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+4+6]
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. Explain the concept of pattern recognition and how artificial neural network is helping in the pattern recognition problems. [6+10]

\*\*\*\*\*

**IV B.Tech II Semester Regular Examinations, Apr/May 2006**  
**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. State and prove the perceptron convergence theorem. [2+14]
3. Explain the backpropagation algorithm and derive the expressions for weight update relations? [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. 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. Explain the concept of pattern recognition and how artificial neural network is helping in the pattern recognition problems. [6+10]

\*\*\*\*\*