Code No: NR421901 **Set No.1**

IV B.Tech. II Semester Regular Examinations, April/May -2005
NEURAL NETWORKS
(Electronics & Computer Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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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.
   (a) What are the limiting values of this function?
   (b) Find the derivative of $\phi(v)$ with respect to v.
   (c) What is the value of this derivative at the origin?
   (d) Suppose that the shape parameter a is made infinitely large. What is the resulting form of $\phi(v)$?
2. (a) Describe perceptron and explain about its working principle in detail.
   (b) Explain the limitations of perceptron?
3. (a) Explain why is it preferable to have different values of η for weights leading to the units in different layers in a feed forward neural network.
   (b) Discuss a few tasks that can be performed by a backpropagation algorithm.
4. (a) Explain briefly the applications of Boltzman completion network
   (b) With suitable examples, explain different types of associative memories.
5. Explain the Kohonen's method of unsupervised learning. Discuss any example as its application.
6. Describe the following:
   (a) Grossberg layer.
   (b) Counter propagation network.
7. Draw the architectural diagram of ART network and explain the function of each block in detail.
8. Describe how a neural network may be trained for a pattern recognition task. Illustrate with an example

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Code No: NR421901 **Set No.2**

IV B.Tech. II Semester Regular Examinations, April/May -2005
NEURAL NETWORKS
(Electronics & Computer Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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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:

   (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. (a) Describe perceptron and explain about its working principle in detail.

   (b) Explain the limitations of perceptron?

3. (a) Briefly discuss about the sequential and batch modes of training in a back-propagation algorithm and also the stopping criteria.

   (b) Briefly explain about few applications of backpropagation.

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.

5. Explain the architecture and training of Kohonen's self-organizing network.

6. Explain the bidirectional associative memories using suitable examples for storage algorithms.

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

   (b) Describe the architecture and operation of ART2 network.

8. Describe how a neural network may be trained for a pattern recognition task. Illustrate with an example

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Code No: NR421901 **Set No.3**

IV B.Tech. II Semester Regular Examinations, April/May -2005
NEURAL NETWORKS
(Electronics & Computer Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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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.

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.

3. (a) Briefly discuss about the sequential and batch modes of training in a backpropagation algorithm and also the stopping criteria.
   (b) Briefly explain about few applications of backpropagation.

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 ξ_v , and M is the number of fundamental memories. Prove that the above energy function is a Lypunov function.

5. Explain the architecture and training of Kohonen's self-organizing network.

6. Describe the following:
   (a) Grossberg layer.
   (b) Counter propagation network.

7. What is the function of ART network and explain its operation with relevant equations.

8. What are the applications of Kohonens networks in image processing and pattern recognition?

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Code No: NR421901 **Set No.4**

IV B.Tech. II Semester Regular Examinations, April/May -2005
NEURAL NETWORKS
(Electronics & Computer Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. What are feed forward networks? Draw the structure of a single layer feed forward network explain its features and limitations. Discussion how to over come the limitation.

2. (a) Describe perceptron and explain about its working principle in detail.
   (b) Explain the limitations of perceptron?

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.

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.

5. Explain the architecture and training of Kohonen's self-organizing network.

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

7. (a) What are the advantages of ART network. Discuss about gain control in ART network.
   (b) Discuss in detail about orienting subsystem in an ART network.

8. Discuss about the application of Artificial Neural Networks to pattern recognition and image processing.

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