Code No: NR420206 **Set No.1**

IV B.Tech. II Semester Regular Examinations, April/May -2005
NEURAL NETWORKS AND APPLICATIONS
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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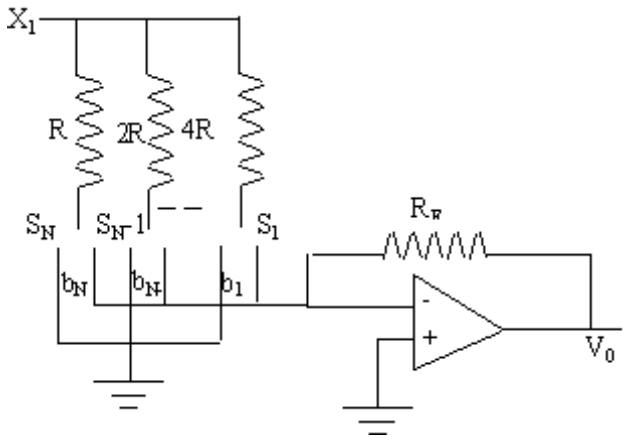
1. (a) Describe the characteristics of artificial neural networks.
   (b) Compare Artificial Neural Networks with Biological Neural Network.
2. (a) What are the requirements of learning laws.
   (b) Distinguish between activation and synaptic dynamics models.
3. Write and discuss about Single layer Discrete Perceptron Training Algorithm.
4. (a) Why convergence is not guaranteed for the back propagation learning algorithm?
   (b) Discuss few tasks that can be performed by a back propagation network and significance of semi linear functions in back propagation.
5. What is gradient type Hopfield Network? Differentiate between Discrete time Hopfield Network and gradient type Hopfield network.
6. A linear array of 10 neurons is trained using One −dimensional data x distributed uniformly between "0" and "1". The data with equal probability of occurrence are thus mapped from one − dimensional pattern space to ten neuron, one − dimensional linear feature space. Solve and explain the above with necessary diagrams.
7. How can-handwritten numerals be modeled using neural network and describe the process of recognition.
8. A linear activation function neuron needs to be designed using three weighted resistor MDACs as

   shown in figure. MDACs are controlled by 4 bit words. The neuron's output voltage needs to be provided the operational amplifier operates in the linear region. Select R_F=4.5R, where R is the resistance determining the MSB switch current , or S_4 current. Calculate the control word setting D_1, D_2, and D_3 that best approximate the required output. Upon completion of the design, find the percent errors in approximation of the specified weight coefficients –8, -4.5, and –2.5 through control words D_1, D_2, and D_3 respectively.


X1
R
2R
4R
SN
SN-1
S1
Rf
bN
bN
b1
-
+
V0

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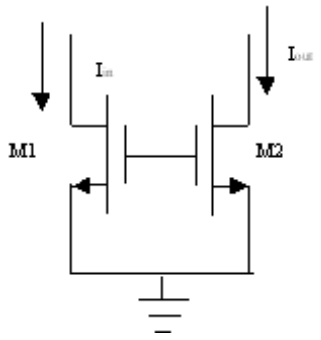
1. (a) How do you justify that brain is a parallel distributed processing system?
   (b) Explain the structure of a brain.
2. Explain in detail the differences between competitive learning and differential competitive learning.
3. Write and discuss about Single layer Continuous Perceptron Training Algorithm.
4. (a) Distinguish between Multi-layer Perceptron and Multi-layer feed forward neural network.
   (b) What are the ill-possed problems in the context of training a Multi-layer feed forward network.
5. In character recognition problems, we can work with small images or large images that have the same features. How large a Hopfield network would be needed to store images corresponding to the characters H, O, P, F, I, E, L, D. What is the expected performance of the network, with respect to the presence of spurious attractors and the amount of noise (corruption) in the input images that can be tolerated?
6. What are kohonen's self organizing maps? Explain the architecture and the training algorithm used for kohonen's SOMs.
7. Derive the back propagation learning rule for the first hidden layer in a three layer (2 hidden layer) feed forward network. Assume that the first hidden layer has k units with weights w_{ki} and differential activations f_{h1}(net k) , the second layer has j units with weights w_{jk} and differential activations f_{h2}(net1) and the output layer has L units with weights w_{lj} and differential activation f_0(net l).
8. Consider the current mirror as figure, with v_{ss}=0 v, I_{in}=10μA and assume transistors M1 and M2 to be identical, with v_{th}=1 v, k^1=20μA/v^2, L=10μm and 40μm. find v_{gs1}=v_{gs2} and the lowest allowable output voltage v_{out} at the present current level I=10μA for proper operation of the current mirror.


M1
M2

⋆ ⋆ ⋆ ⋆ ⋆

Code No: NR420206 **Set No.3**

IV B.Tech. II Semester Regular Examinations, April/May -2005
NEURAL NETWORKS AND APPLICATIONS
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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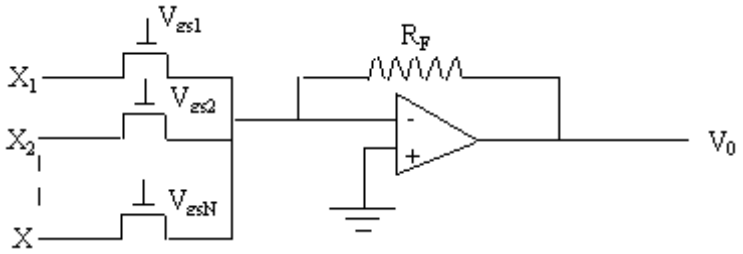
1. (a) What is meant by training of a neural network? Explain in detail with an example.
   (b) Differentiate ANN with biological Neural Network.
2. Write notes on:
   (a) Error correction learning.
   (b) Reinforcement learning.
3. Write and discuss about R − category Discrete Perceptron Training Algorithm.
4. (a) Consider a 4 input and 3 output problem, where the output should be the result of sum of 2 bit input numbers.
   (b) Explain how Pattern mode and Batch mode affect the result of back propagation.
5. (a) Define recurrent network. Give some examples.
   (b) Draw the flowchart of producing solution of optimization problems using feedback networks.
6. Explain the architecture of ART-1 neural networks with emphasis on the function of each part. What is the importance of the vigilance parameter in its working?
7. Explain the neural network configuration for plant identification. Derive for forward plant identification and plant inverse identification.
8. The scalar product circuit with electrically tunable weights as illustrated in figure uses R_F=10KΩ and NMOS transistors with k^1=20μA/v^2, W/L=10, and v_{th}=2v. The circuit needs to implement the function v_0=-2.5x_1-6x_2-4x_3.Complete the design of the circuit by computing the range of input voltages x_1, x_2 and x_3 ensuring the linearity of the channel resistance. Use the linearity condition v_{dsi}=v_I $< 0.5(v_{gsi}$-2), for I=1,2,3.


V_{es1}
R_F
X_1
V_{es2}
X_2
V_0
V_{esN}
X
-
+

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Code No: NR420206 **Set No.4**

IV B.Tech. II Semester Regular Examinations, April/May -2005
NEURAL NETWORKS AND APPLICATIONS
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
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1. (a) Discuss the recent trends in neural networks.
   (b) Describe the model of artificial neuron.
2. Suggest and explain activation model and learning method for solving non-linear activation problems.
3. Explain perceptron training for an image recognition system.
4. Design and train a feed forward networks for the problems.
   (a) Consider a 4 input and 1 output problem where the Output required to be 'one', if the input configuration is symmetrical and 'zero' otherwise.
   (b) Why back propagation is also called as generalized delta rule.
5. (a) Construct a Hopfield network to associate 3x3 input images with dots and dashes.
   (b) How many spurious attractors does this network have i.e how many patterns other than dots and dashes are stable attractors?
   (c) How many input errors can this network withstand i.e how much can the image of a dot (or dash) be corrupted while still allowing the network to retrieve a dot (or dash)?
6. (a) Write short notes on unsupervised learning of clusters.
   (b) Explain the concept of cluster discovery network.
7. What do you understand by neural controller? Explain the capability of a simple neural network to learn to balance an inverted pendulum. How is this method different from the traditional contour approaches.
8. What do you understand by finite resolution and conversion error. Explain the circuit producing a single digitally programmable weight employing a multiplying D/A converters (MDAC).

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