

(Following Paper ID and Roll No. to be filled in your
Answer Books)

Paper ID : 131663

Roll No.

B.TECH.

Theory Examination (Semester-VI) 2015-16

ARTIFICIAL NEURAL NETWORK

Time : 3 Hours

Max. Marks : 100

Section-A

1. Attempt all the questions. All questions carry equal marks. (2×10=20)

(a) What are the features of biological network that make it superior to the most sophisticated artificial intelligent system?

(b) Design a network using MP neuron to realize following logic function using ± 1 for the weights

$$S(a_1, a_2, a_3) = a_1 a_3 + a_2 a_3 + \overline{a_1 a_3}$$

(c) What is noise saturation dilemma in activation dynamics?

- (d) What is the difference between supervised learning and reinforced learning?
- (e) What is the significance of Lyapunov function in neural networks?
- (f) What are the main functional units used in ANN for pattern recognition task?
- (g) Illustrate with diagram what do you mean by accretive and interpolative behavior in pattern clustering?
- (h) What is meant by stochastic update of a neuron?
- (i) What are the limitations of back propagation network?
- (j) Mention any two applications of ANN in (i) Speech
(ii) Image processing

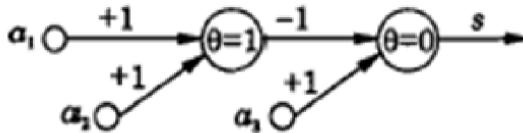
Section-B

2. Attempt any FIVE questions from the following.

(5×10=50)

2. (a) Explain briefly the terms Cell body, Axon, Synapse, dendrite and neuron with respect to a biological neural network

- (b) Explain the logic functions (using truth tables) performed by the network with MP neurons shown in the figure below:



3. (a) With respect to ANN what is a learning law? What are the requirements of learning laws for effective implementation?
- (b) Discuss in brief different types of Hebbian learning.
4. Explain (with derivation) how optimum weight value can be approached in a finite number of steps using the perceptron learning law for linearly separable problems
5. Explain the difference between LMS learning and delta learning. Why LMS learning is called a stochastic gradient descent method?
6. (a) Explain the concept of equilibrium in stochastic neural networks.
- (b) For a 5-unit Feedback network the weight matrix is given by

$$W = \begin{bmatrix} 0 & 1 & -1 & -1 & -3 \\ 1 & 0 & 1 & 1 & -1 \\ -1 & 1 & 0 & 3 & 1 \\ -1 & 1 & 3 & 0 & 1 \\ -3 & -1 & 1 & 1 & 0 \end{bmatrix}$$

assuming that the bias and the input of each of the units to be zero, Compute the energy for the following states

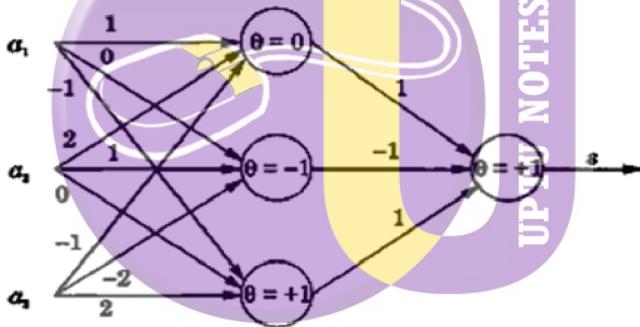
$$S = [-1 \ 1 \ 1 \ 1 \ 1]^T \text{ and } S = [-1 \ -1 \ 1 \ -1 \ -1]^T$$

7. What is the basis for Boltzmann learning law? Explain the implementation details of Boltzmann's machine law. What are the limitations of Boltzmann's learning?
8. What is the significance of 'resonance' in ART networks? Explain briefly the operation of an ART for binary patterns. Mention some extensions of ART concept
9. (a) Explain how an image smoothing problem can be solved by principles of neural network
- (b) What is the significance of neural network in NETtalk application?

Section-C

Attempt any TWO questions from the following. (15×2=30)

10. (a) What are the main differences among the models of artificial neuron namely, McCulloch- Pitts, perceptron and Adaline?
- (b) What will be the output of the network shown for the input $[1 \ 1 \ 1]^T$



- (c) What is the difference between auto-associative and hetero-associative problem?
11. (a) Compute the weight matrix for the following pattern association task

$$\mathbf{a}_1 = \begin{bmatrix} \frac{1}{6} & -\frac{5}{6} & -\frac{1}{6} & \frac{1}{2} \end{bmatrix}^T, \quad \mathbf{b}_1 = [1 \ 0 \ 0]^T$$

$$\mathbf{a}_2 = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} \end{bmatrix}^T, \quad \mathbf{b}_2 = [0 \ 1 \ 1]^T$$

$$\mathbf{a}_3 = \begin{bmatrix} -\frac{5}{6} & \frac{1}{6} & -\frac{1}{6} & \frac{1}{2} \end{bmatrix}^T, \quad \mathbf{b}_3 = [0 \ 0 \ 0]^T$$

- (b) Explain the distinction between
- (i) Pattern association and pattern classification task
 - (ii) Pattern classification and functional approximation task
12. (a) Prove that BAM (Bidirectional Associative Memory) is unconditionally stable for any binary units
- (b) Discuss in brief at least two applications of ANN that use (i) Associative memory (ii) Optimization