Total number of printed pages–4

53 (EC 811) ARNW

2021

ARTIFICIAL NEURAL NETWORK

Paper : EC 811

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* What is an activation function? Describe following activation functions with mathematical formula — 2+3×2=8

   (i) Sigmoid function

   (ii) Piecewise linear function

   (iii) Threshold function.

Contd.

(b) Name different learning mechanism of an artificial neural networks. Provide comparative discussion for all these learning methods. 12

2. (a) Describe different parameters of an ANN. Describe in brief, the following in light of perceptron convergence algorithm — 3+12=15

(i) Initialization

(ii) Activation

(iii) Computation of actual response

(iv) Weight upgradation.

(b) Define X-OR problem in single layer perceptron. 5

3. (a) What is Multilayer perceptron ? How is it different from single layer perceptron ? Explain how weight updation is carried out in multilayer perceptron. 3+2+10=15

(b) What are the differences between Sequential and Batch mode of training of artificial neural network. 5

4. *(a)* Describe supervised learning as an optimization problem. Show the quadratic error hyper-surface, the weight adjustment rule is —

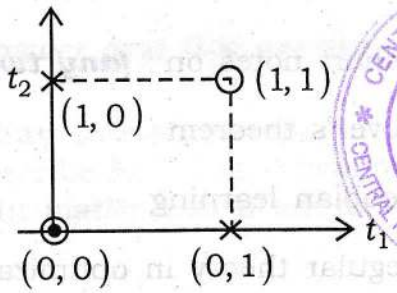
$$\Delta w^*(n) = H^{-1}(n)\, g(n)$$

where $H(n)$ is the Hessian matrix and $g(n)$ is the gradient vector at iteration n. 12

(b) Describe conjugate gradient method for a quadratic error function optimization. 8

5. *(a)* What is radial basis function ? Explain the advantages of radial basis network over multilayer perception. 2+3=5

(b)



The *Fig.* shows an X-OR problem where feature points are located in the diagonal points of a square shaped feature space. Explain how radial basis function can draw a boundary between these two types of features. 15

6. *(a)* Draw the structure of a CNN and explain the following terminologies : 4+6×1½=13

(i) Tensor image

(ii) Convolution kernel

(iii) Stride

(iv) RELU

(v) Sub-sampling

(vi) Max-pooling

(b) Draw a structural diagram of an Autoencoder. State *two* applications of an autoencoder. 5+2=7

7. Write short notes on : ***(any two)*** 10×2=20

(a) Cover's theorem

(b) Hebbian learning

(c) Regular theory in optimization

(d) GAN