AUTUMN MAKE UP MID SEMESTER EXAMINATION-2023

School of Computer Engineering
Kalinga Institute of Industrial Technology, Deemed to be University
Subject Name: Computational Intelligence
[Subject Code: CS 3031]

Time: 1 1/2 Hours   **Full Mark: 40**

Answer All the Questions.
The figures in the margin indicate full marks. Candidates are required to give theiranswers in their own words as far as practicable and all parts of a question should beanswered at one place only.

1. Answer all the questions. [2 x 5]

    a) What are the essential components of Soft Computing, and what is their significance in problem-solving?

    b) Consider a Radial Basis Function Network consisting of one hidden layer containing 6 neurons. The input to this network is represented by a 4D feature vector and is designated for a classification task with 3 classes. In the output layer, the bias is connected with three output neurons. Calculate the number of connection weights and biases in the RBF network.

    c) When hyperbolic tanget function is used as activation function (φ) in the neuron network, the output of the a neuron $y = \varphi(v) = \frac{e^{av}-e^{-av}}{e^{av}+e^{-av}}$. Show that the derivative of $\varphi(v)$ with respect to v is given by $\frac{d\varphi(v)}{dv} = a(1+y)(1-y)$.

    d) The inputs to a single neuron are $x1 = 0.163$, $x2 = 0.721$, weights on them $w1 = 0.386$, $w2 = 0.527$ and $bias = 0.104$. Find the output of the neuron, if it uses logistic activation function with $a = 0.01$.

    e) Discuss the importance of bias in the neural network.

2. Find the new weights and total squared error after epoch-1 to classify AND function with bipolar input and targets using ADALINE network. Set initial weight w1=w2=b=0.1. learning rate = 0.1.
[10 Marks]

3. Find the new weights in the output layer only for the following back propagation network after presenting input [0.23, 0.07] and target 0.37. Use logistic activation function, consider learning rate = 0.6 [10 Marks]

4. How does the Gaussian kernel function in an RBFN achieve linear separation for XOR data points and show how this linear separation is realized? [10 Marks]

*** Best of Luck ***