

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

Theory Examination-III, May 2022
M. Tech.(A&R), Semester II

Roll No.....

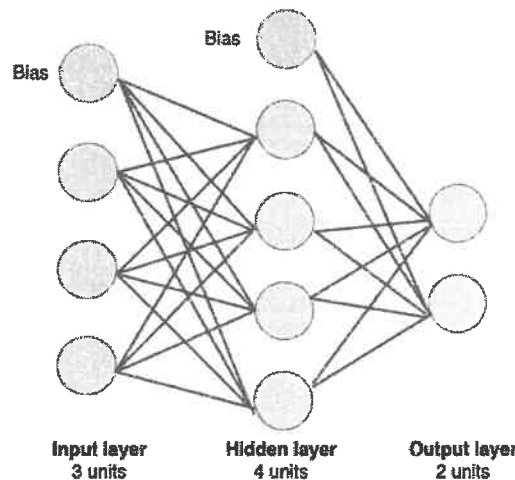
Course Code: EE2106
Course Name: Intelligent Control Systems

Time: 02 hours and 30 minutes Max.
Marks: 30

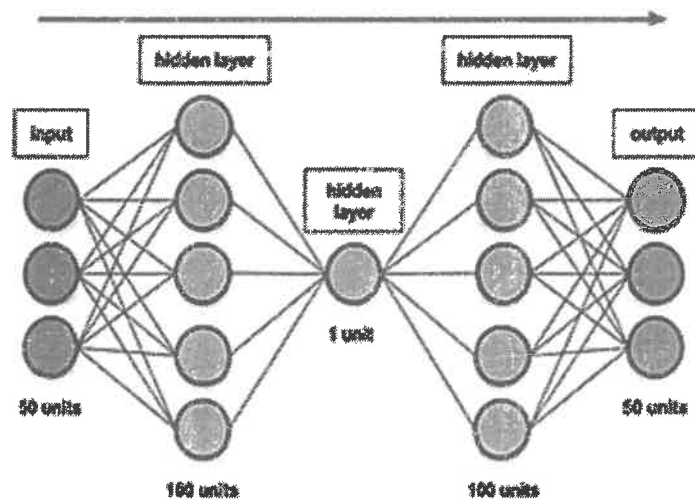
Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/flow chart, wherever required, are an integral part of the answer.
4. Calculator allowed

Q.1 Estimate number of parameters required for below ANN architecture. [03+04]
(LO-1,3) (a)

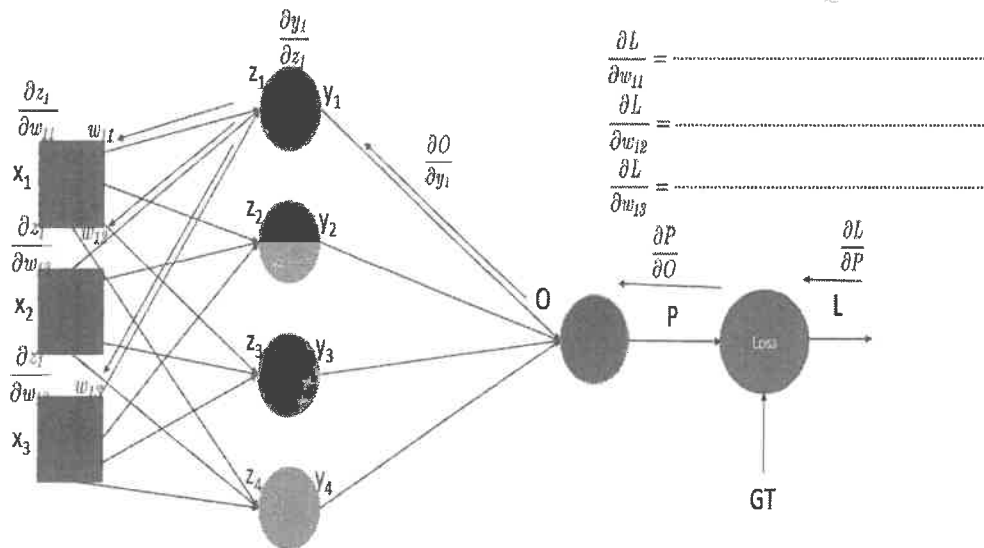


(b)

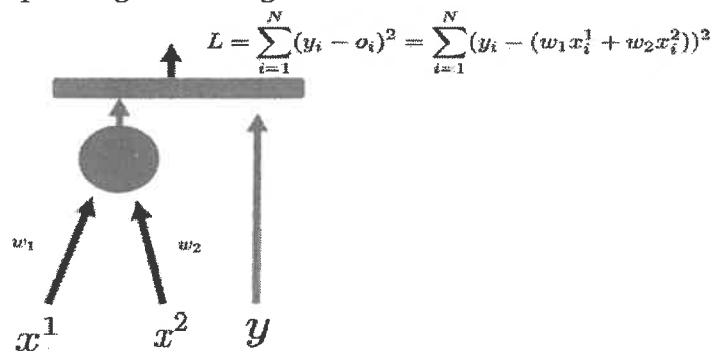


Q.2 Develop an algorithm for designing a fuzzy logic controller for an air [06]
(LO-1,3) conditioning system. Consider linguistic term for Room Temperature and target temperature as verycold, cold, warm, very warm, hot.

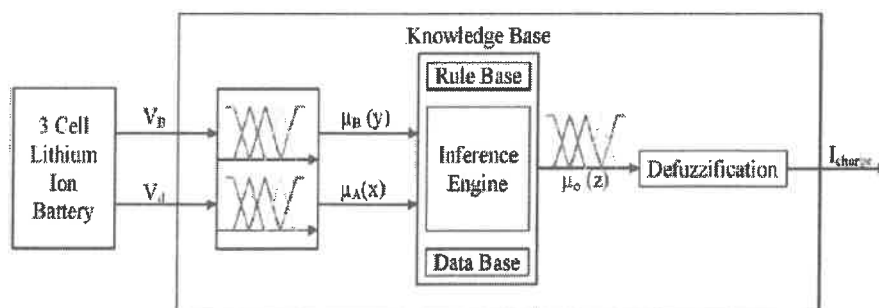
- Q.3 (LO-3) A backpropagation algorithm used to update below architecture. Write an expression for partial differential equations as indicated. [03]



- Q.4 (LO-3) In the learning in neural networks, goal is to minimize the loss function by adjusting weight W of neural network. A gradient descent algorithm is used to the loss function. Write an expression for partial differential equations for updating both weights as indicated. [02]



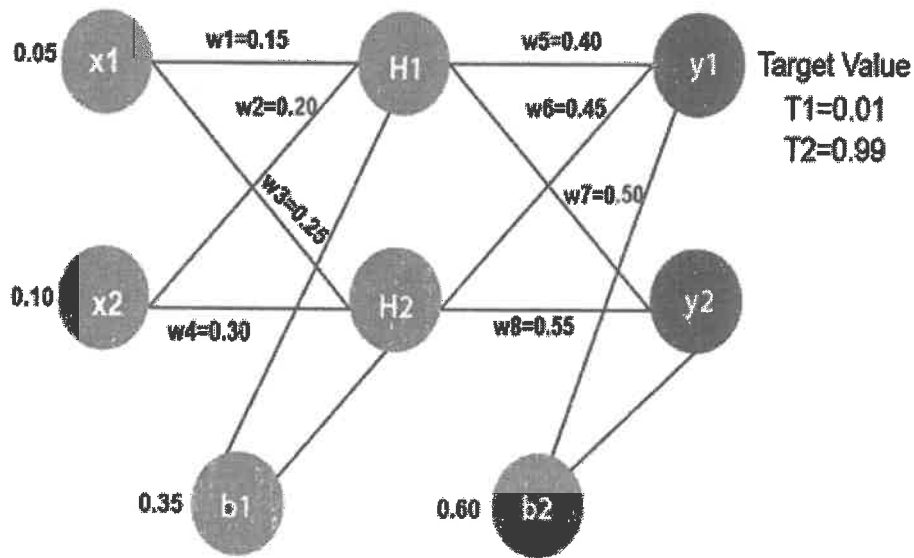
- Q.5 (LO-1.3) A fuzzy logic controller was implemented to enhance the charging efficiency of a lithium-ion battery. The fuzzy controller has two inputs. The first is the lowest single-cell voltage of the string (V_B), and the other one is the highest voltage difference between the two cells of the battery (V_d), as shown in below diagram. Construct a rule table by using five linguistic terms for input variables VS (very small), S (small), M (medium), LVL (very large). [03]



Q.6
(LO-1)

The main features of Backpropagation are the iterative, recursive, and efficient method through which it calculates the updated weight to improve the network until it is not able to perform the task for which it is being trained. Initial weights, biases, inputs, and targeted outputs as shown in below figure. Do it mathematically to compute new values of w_1 , w_2 , w_3 , and w_4 after using Backpropagation after one complete iteration.

[09]



Consider activation function as $output = \frac{1}{1+e^{inp}}$

η = learning rate = 0.5

