KATHMANDU UNIVERSITY
End Semester Examination
December, 2024

Level : B.E.
Year : IV
Time : 2 hrs. 30mins.

31 Dec 2024

Course : ETEG 425
Semester : I
F. M. : 40

SECTION "B"
[4 Q. × 10 = 40 marks]

*Attempt **ANY FOUR** questions. Each question carries 10 marks. Marks are indicated inside brackets.*

1.

a. Define bias and threshold in context of ANN. State the significance of weights used in ANN. [2+1]

b. Realize a Hebb net for the OR function with bipolar inputs and targets. [4]

c. How is "winner-takes-all" process executed by competitive learning? Explain. [3]

2.

a. Compare Perceptron and Hebb net. Justify, why single layer perceptron network could not solve even XOR problem. [2+1]

b. Use outer product rule to find the weight matrix in a hetero associative net having the following binary input-output vector pairs where S= (x_1, x_2, x_3, x_4) are input vectors and t= (t_1, t_2) are output vectors. [4]

S_1= (1 0 0 1)	t_1= (0 1)
S_2= (1 0 1 0)	t_2= (0 1)
S_3= (1 1 0 0)	t_3= (1 0)
S_4= (1 1 1 0)	t_4= (1 1)

c. Differentiate between auto associate and hetero associative memory with their architecture. [3]

3.

a. Consider the following real variables from everyday life: [3]

- Income measured in NRs.
- Speed measured in meters per second.
- A meal measured in how much you like to eat it.
- A traffic light measured in what colour is on.

In each case, suggest a fuzzy variable corresponding to these real variables. For which of these five variables the use of a fuzzy variable is not really necessary? Justify your answer.

b. List the applications of neural networks in electrical and electronics engineering. Discuss the architecture of Neuro-Fuzzy System with an example. [2+3]

c. Determine the union and intersection of fuzzy sets A and B, given [2]

A(x)={(x1,0.7),(x2,0.3),(x3,0.9),(x4,0.1)}
B(x)={(x1,0.2),(x2,0.5),(x3,0.7),(x4,0.4)}

P.T.O.

4.

a. What is the objective function of gradient descent? Describe Back Propagation learning in brief. [1+3]

b. What is the purpose of defuzzification? Explain at least one method used for defuzzification. [1+2]

c. Justify, how temperature control is achieved by using fuzzy logic. [3]

5.

a. Consider LVQ net with five vectors assigned to two classes. [4]

Vectors	**Class**
(1 0 0 1)	1
(0 1 0 0)	2
(1 1 1 1)	2
(1 1 0 0)	1
(0 1 1 0)	2

Assuming the first two vectors as the initial weight, calculate the new weights after the first epoch.

b. Write down the training algorithm used in Kohonen self-organizing feature map. [3]

c. Obtain the output of the neuron Y for the network shown in the figure. [3]