

SETSQUARE ACADEMY

Degree Engineering (MU)

**COMPUTER ENGINEERING
B.E. SEMESTER VII**

Question Paper Set

**SOFT COMPUTING
(December 2015 - May 2017)**

As per the Revised Syllabus effective from Academic Year 2015–16

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SOFT COMPUTING

DECEMBER 2015

(REVISED COURSE)

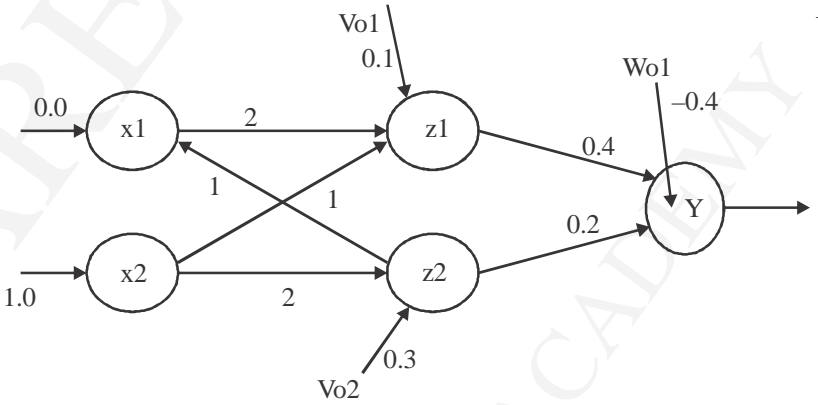
(3 Hours)

QP Code : 6000

[Total Marks : 80]

MD-Con.10767-16

- N.B.: (1) Question No.1. is compulsory
 (2) Attempt any three questions out of remaining 5 questions
 (3) Draw neat labeled diagram wherever necessary.

1. Solve any four : 20
 - (a) Define soft computing? Distinguish between soft computing and hard computing.
 - (b) Determine (alpha) α - level sets and strong α -level sets for the following fuzzy set.
 $A = \{(1,0.2), (2,0.5), (3,0.8), (4,1), (5,0.7), (6,0.3)\}$;
 - (c) Prove that the first order derivative of a unipolar continuous activation function $f'(net) = 0(1-0)$
 - (d) Draw the five layer architecture of ANFIS and explain each layer in brief.
 - (e) What are the differences between derivative free and derivative based optimization.
 - (f) Distinguish between Supervised and Un-supervised learning
2. Design a fuzzy controller for a train approaching station. Inputs are speed and Distance and output is Break power. Use triangular membership function. Consider two descriptor for Input and three descriptors for output, Derive a set of rules for control action and defuzzification. The design should be supported by figures wherever possible. Design a fuzzy controller for a train with high speed and small distance. 20
3. (a) Apply Backpropagation Algorithm to find the final weights for the following net. Inputs: $x = \{0.0, 1.0\}$, Weights between Hidden and Output Layers: $w = \{0.4, 0.2\}$, Bias on the Output Node O is $W_o = \{-0.4\}$, Weights between input and Hidden Layer: $v = \{2, 1; 1, 2\}$, Bias on Hidden Unit nodes are $V_o = \{0.1, 0.3\}$, Desired output : $d = 1.0$ 10

- (b) What is self-organizing map? Draw and explain architecture of Kohonen Self organization Feature Map KSOFM. 10
4. (a) What are the different types of encoding, selection, crossover, mutations of GA. Explain each type with suitable examples 10
 (b) Explain with suitable examples Linearly and Non-linearly separable pattern classification 10
5. (a) Explain Learning Vector Quantization Algorithm? 10
 (b) The formation of algal solutions in surface water is strongly dependent on pH of water, temperature and oxygen content. T is a set of water temperatures from a lake given by $T = (50, 55, 60)$ and 0 is oxygen content values in water given by $O = (1, 2, 6)$ The fuzzy set of T is given by $\{0.7/50 + 0.8/55 + 0.9/60\}$ and fuzzy set of O is given by $\{0.1/1 + 0.6/2 + 0.8/6\}$
 (i) Find $R = T \times O$ for Given $I = \{0.5/50 + 1/55 + 0.7/60\}$
 (ii) Find $S = 10 R$ using max-product composition
 (iii) Find $S = I \circ R$ using max-min composition 10

6. Write short notes on any two: 20
- (a) Steepest Descent algorithm (b) Newton Method (c) Fuzzy inference system

MAY 2016

FW-Con.11659-16

(REVISED COURSE)

QP Code : 31392

(3 Hours)

[Total Marks : 80]

- N.B.: (1) Question no.1 is compulsory.
(2) Solve any THREE out of FIVE remaining questions.

1. (a) Define soft computing? Distinguish between soft computing and hard computing. 5
(b) Explain Mc Culloch Pitts neuron model with the help of an example. 5
(c) Determine (alfa) α -level sets and strong α -level sets for the following fuzzy set. 5
 $A = \{(1,0.2), (2,0.5), (3,0.8), (4,1), (5,0.7), (6,0.3)\}$
(d) Explain linear separable and non-linearly separable pattern with example. 5
2. (a) What is learning in neural networks? Differentiate between supervised and unsupervised learning. 10
(b) Explain any four defuzzification methods with suitable example. 10
3. (a) Explain error back propagation training algorithm with the help of a flowchart. 10
(b) Explain genetic algorithm with the help of an example. 10
4. (a) Prove the following identities: 10
 (i) For unipolar continuous activation function $f'(net) = o(1-o)$.
 (ii) For bipolar continuous activation function $f'(net) = o(1-o^2)/2$.
(b) Explain perceptron learning with the help of an example. 10
5. (a) Explain ANFIS architecture with neat diagram. 10
(b) Explain Mamdani type of fuzzy inference systems in detail. 10
6. Write note on any two of the following. 20
(a) Winner take all learning rule. (b) Learning vector quantization.
(c) Character recognition using neural network.

DECEMBER 2016

(REVISED COURSE)

QP Code : 790702

(3 Hours)

[Total Marks : 80]

- N.B.: (1) Question No.1 is compulsory.
(2) Solve any three out of five remaining questions.

1. (a) Define Support, Core, Crossover points, Normality and Convex Fuzzy sets. 5
(b) What are the types of neural processing? 5
(c) State differences between derivative based and derivative free optimization techniques? 5
(d) What are the features of hybrid system? Why is it required? 5
2. Design a fuzzy controller for a train approaching or leaving a station. The inputs are the distance from the station and speed of the train. The output is the amount of brake power used. Use four descriptors each for inputs and output and design using mamdani fuzzy model. Derive set of rules for control action and defuzzification. The design should be supported by figures. Prove that if the train is at a short distance with great speed the brake power required would be very high and vice versa. 20

3. (a) Four steps of Hebbian learning of a single neuron network is implemented starting with $w^1 = [1 \ -1]$ at the rate = 1, using the inputs given below :
 $X_1 = [1, -2]$ $X_2 = [0, 1]$ $X_3 = [2, 3]$ $X_4 = [1, -1]$
 Find final weights for binary continuous activation function, 10
 (b) Explain Error Back Propagation training algorithm with flow chart. 10
4. (a) How is LVQ working as a classifier? With a neat flow explain the working of LVQ ? 10
 (b) What are the steps in Genetic Algorithm? Explain examples the uniform crossover, tournament selection and mutation. 10
5. (a) What are the types of Fuzzy Inference Systems? Explain each with appropriate diagrams, 10
 (b) Explain ANFIS architecture with a neat diagram. 10
6. Write short notes on any four : 20
 (a) Fuzzy extension principle (b) Flowchart of Single Discrete Perceptron Algorithm (SDPTA)
 (c) Kohonen Learning Algorithm (d) Newton's Method in derivative based optimization
 (e) CANFIS

MAY 2017

(REVISED COURSE)

(3 Hours)

QP Code : 790700

[Total Marks : 80]

N.B.: (1) Question No.1 is compulsory.

(2) Solve any three out of five remaining

1. (a) Explain hard limit and soft limit activation function 5
 (b) Explain Mc Culloch Pitts neuron model with the help of an example. 5
 (c) Explain fuzzy extension principle with the help of an example. 5
 (d) Explain linear separable and non-linearly separable pattern with example. 5
2. (a) What is learning in neural networks? Differentiate between supervised and unsupervised learning 10
 (b) What are the different types of encoding, selection, crossover, mutations of GA. Explain each type with suitable examples. 10
3. (a) Explain error back propagation training algorithm with the help of a flowchart. 10
 (b) Explain any four defuzzification methods with suitable example. 10
4. Design a fuzzy controller to determine the wash time of domestic washing machine. Assume that input is dirt and grease on clothes. Use three descriptors for input variables and five descriptors for out variables. Derive set of rules for control the action and defuzzification. The design should be supported by figures. Show if the clothes are soiled to larger degree the wash time will be more and vice versa. 20
5. (a) Prove the following identities : 10
 (i) For unipolar continuous activation $f'(net) = 0(1 - 0)$.
 (ii) For bipolar continuous activation function $f'(net) = 0(1 - 0^2)/2$
 (b) Explain learning vector quantization Algorithm. 10
6. Write short note on any two : 20
 (a) Kohonen self organizing feature maps. (b) ANFIS architecture (c) Newton Method