SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

VIII SEMESTER

1905802- SOFT COMPUTING TECHNIQUES

Regulation – 2019

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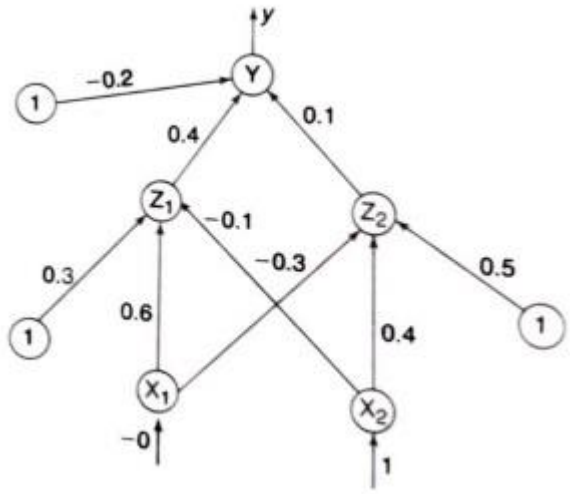
Unit I - Artificial Neural Network				
Review of fundamentals – Biological neuron, artificial neuron, activation function, single layer perceptron – Limitation – Multi layer perceptron – Back Propagation Algorithm (BPA) – Recurrent Neural Network (RNN) – Adaptive Resonance Theory (ART) based network – Radial basis function network – online learning algorithms, BP through time – RTRL algorithms – Reinforcement learning				
PART – A				
Q.No	**Questions**	**Course Outcome**	**BT Level**	**Competence**
1	What is soft computing?	CO1	BTL 1	Remember
2	Compare soft computing vs. hard computing.	CO1	BTL 4	Analyze
3	Classify the various types of soft computing techniques	CO1	BTL 2	Understand
4	Distinguish between artificial neuron & biological neuron.	CO1	BTL 1	Remember
5	Sketch the model of artificial neuron.	CO1	BTL 1	Remember
6	Define an artificial neural network.	CO1	BTL 2	Understand
7	State the function of synapse.	CO1	BTL 5	Evaluate
8	Explain a single layer net and multilayer net?	CO1	BTL 3	Apply
9	Evaluate the learning rate and its function	CO1	BTL 3	Apply
10	Justify why Artificial Neural Network is called adaptive system during training.	CO1	BTL 4	Analyze
11	Name some activation functions used in ANN?	CO1	BTL 2	Understand
12	Write the expression for binary and bipolar sigmoid activation function.	CO1	BTL 4	Analyze
13	Categorize single layer net and multilayer net.	CO1	BTL 4	Analyze
14	What is the significance of error signal in perceptron network?	CO1	BTL 1	Remember
15	Draw the architecture of back propagation algorithm.	CO1	BTL 2	Understand
16	What are the factors affecting back propagation training?	CO1	BTL 3	Apply
17	Why is the McCulloch Pitts neuron widely used in logic functions?	CO1	BTL 6	Create
18	Explain the factors affecting back propagation training?	CO1	BTL 1	Remember
19	State the features of Recurrent Neural Network.	CO1	BTL 6	Create
20	List out the types of adaptive resonance theory.	CO1	BTL 2	Understand
21	State the applications of adaptive resonance theory.	CO1	BTL 5	Evaluate
22	Illustrate the activation function used in radial basis function	CO1	BTL 3	Apply

23	Sketch the block diagram of Reinforcement learning	CO1	BTL 5	Evaluate
24	What is the difference between back propagation and back propogation through time?	CO1	BTL 1	Remember
	PART – B			
1	(i)What are the applications of soft computing techniques? (5) (ii) Differentiate the features of soft computing and hard computing. (8)	CO1	BTL 2	Understand
2	Draw and describe the structure of a biological neuron.(13)	CO1	BTL 1	Remember
3	Draw a simple artificial neuron and discuss the calculation of net input. (13)	CO1	BTL 1	Remember
4	Using McCulloh-Pitts neuron model, design a neural network for 2-input OR functions. (13)	CO1	BTL 4	Analyze
5	Explain with a neat diagram the neural network architecture of multilayer feed forward network. (13)	CO1	BTL 4	Analyze
6	Write short notes on Adaline and Madaline networks. (13)	CO1	BTL 6	Create
7	Explain the working of back propagation neural network with neat architecture and flowchart. (13)	CO1	BTL 5	Evaluate
8	Discuss in detail the various types of activation function used in neural network with aid of graphical as well as mathematical representation and its output. (13)	CO1	BTL 3	Apply
9	Implement OR function with binary inputs and bipolar targets using perceptron training algorithm using 3 epochs. (13)	CO1	BTL 5	Evaluate
10	Sketch the flowchart for back propagation network training and explain. (13)	CO1	BTL 2	Understand
11	Describe in detail the various steps involved in the Adaptive Resonance Theory 1 training algorithm. (13)	CO1	BTL 1	Remember
12	(i)List the advantages and disadvantages of ART network. (8) (ii) What are the applications of ART network. (5)	CO1	BTL 4	Analyze
13	Explain the training algorithm of radial basis function network. (13)	CO1	BTL 3	Apply
14	Enumerate the back propagation through time in detail. (13)	CO1	BTL 1	Remember

15	Explain with an example the working of Recurrent Neural Network (RNN). (13)	CO1	BTL 2	Understand
16	Mention the four radial basis function networks. Sketch and explain in detail. (13)	CO1	BTL 3	Apply
17	Describe the architecture of radial basis function network. (13)	CO1	BTL 2	Understand
	PART – C			
1	Can a two input Adaline compute the XOR function? Analyse the XOR function using Madaline? (15)	CO1	BTL 4	Analyze
2	Find the weights required to perform the following classification using perceptron network. The vectors (1,1,1,1) and (-1,1,-1,-1) are belonging to the class (so that target value 1), vectors (1,1,1,-1) and (1,-1,-1,1) are not belonging to the class (so that target value -1). Assume learning rate a 1 and initial weights as 0. (15)	CO1	BTL 5	Evaluate
3	Using back propagation network, find the new weights when the net illustrated in given figure is presented with the input pattern [0, 1] and target output is 1. Use a learning rate $\alpha = 0.25$ and the binary sigmoid activation function. (15) 	CO1	BTL 5	Evaluate
4	Consider an ART 2 network with two input units. (n=2). Show that using $\Theta = 0.7$will force the input patterns (0.71, 0.69) and (0.69, 0.71) to different clusters. What role does the vigilance parameters play in this case? Assume necessary parameters. (15)	CO1	BTL 6	Create
5	Explain in detail about the RTRL Algorithm. (15)	CO1	BTL 5	Evaluate

Unit II - Neural Networks For Modeling And Control

Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture– Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox.

PART – A

Q.No	Questions	Course Outcome	BT Level	Competence
1	What is nonlinearity in ANN?	CO2	BTL 1	Remember
2	List out the features of ANN for modelling and control of nonlinear systems.	CO2	BTL 4	Analyze
3	Name some activation functions used in ANN?	CO2	BTL 3	Apply
4	Justify why Artificial Neural Network is called adaptive system during training.	CO2	BTL 3	Apply
5	What is parameter Estimation?	CO2	BTL 1	Remember
6	What are the optimization techniques in neural network?	CO2	BTL 5	Evaluate
7	What are the properties of adaptive resonance theory?	CO2	BTL 2	Understand
8	Which causes nonlinearity in NN?	CO2	BTL 2	Understand
9	What is optimum neural network?	CO2	BTL 2	Understand
10	List the types of nonlinear function.	CO2	BTL 3	Apply
11	Which makes a neural network nonlinear?	CO2	BTL 6	Create
12	What are the different types of ANN?	CO2	BTL 1	Remember
13	Draw the basic model of Adaline network and Madaline Network.	CO2	BTL 2	Understand
14	Evaluate the learning rate and its function	CO2	BTL 4	Analyze
15	For derivative -based learning procedure why a sigmoidal function is used instead of a step function?	CO2	BTL 1	Remember
16	What is neural network toolbox?	CO2	BTL 1	Remember
17	What is the purpose of Hopfield Network? Give an example?	CO2	BTL 4	Analyze
18	Why Hopfield network is called as recurrent neural network?	CO2	BTL 2	Understand
19	Conclude the limitations of competitive learning?	CO2	BTL 1	Remember
20	Give the characteristics of counter propagation network	CO2	BTL 3	Apply
21	Explain stability-plasticity dilemma?	CO2	BTL 6	Create
22	Justify why Artificial Neural Network is called adaptive	CO2	BTL 5	Evaluate
23	Explain the factors affecting back propagation training?	CO2	BTL 4	Analyze
24	What are the properties of adaptive resonance theory?	CO2	BTL 5	Evaluate
	PART – B			
1	Write short notes on Modelling of non-linear sytems using ANN. (13)	CO2	BTL 6	Create
2	Explain with a neat diagram the neural network architecture of multilayer feed forward network. (13)	CO2	BTL 4	Analyze

3	Describe the nonlinear models of ANN (13)	CO2	BTL 2	Understand
4	Where does the training information come from in ANN? Explain in detail. (13)	CO2	BTL 2	Understand
5	What is the need of optimal network? Explain the optimal architecture? (13)	CO2	BTL 5	Evaluate
6	How is direct inverse control implemented? Explain in detail. (13)	CO2	BTL 1	Remember
7	List out the basic neural network controller designs in detail. (13)	CO2	BTL 4	Analyze
8	Describe with a neat diagram the architecture of recurrent network to perform XOR task with two inputs. (13)	CO2	BTL 3	Apply
9	Draw the architecture of full counter propagation network and represent the active units in the first and second phase of counter propagation training. (13)	CO2	BTL 3	Apply
10	Develop and describe with a neat diagram the counter propagation network learning algorithm. (13)	CO2	BTL 5	Evaluate
11	Explain briefly the full counter propagation with architecture and its functioning. (13)	CO2	BTL 1	Remember
12	Explain characteristic features, limitations and applications of associative memory. (13)	CO2	BTL 1	Remember
13	Describe in detail the model validation in ANN. (13)	CO2	BTL 3	Apply
14	Give Short notes on parameter and structural Learning. (13)	CO2	BTL 4	Analyze
15.	Enumerate in detail the Direct and indirect neuro control schemes. (13)	CO2	BTL 1	Remember
16.	Explain the features of model validation. (13)	CO2	BTL 2	Understand
17.	Describe with a neat diagram the architecture of recurrent network to perform XOR task with two inputs. (13)	CO2	BTL 2	Understand
PART – C				
1	Explain different types of training algorithms used in ANN with an example. (15)	CO2	BTL 6	Create
2	Describe about the control of nonlinear systems using ANN with a sample case. (15)	CO2	BTL 5	Evaluate
3	Detail about the neural network toolbox in MATLAB with an example. (15)	CO2	BTL 5	Evaluate
4	Develop and describe with a neat diagram the counter propagation network learning algorithm. (15)	CO2	BTL 6	Create

5.	Describe the models for the identification of nonlinear dynamical systems. (15)	CO2	BTL 5	Evaluate

Unit III - Fuzzy Set Theory

Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions.

PART – A

Q.No	Questions	Course Outcome	BT Level	Competence
1	What is meant by fuzzy logic?	CO3	BTL 6	Create
2	List the components of fuzzy logic.	CO3	BTL 1	Remember
3	How does a fuzzy set differ from crisp set?	CO3	BTL 4	Analyze
4	What is cardinality of a Fuzzy set? Whether a power set can be formed for a fuzzy set?	CO3	BTL 1	Remember
5	What is an empty Fuzzy set and height of a Fuzzy set?	CO3	BTL 1	Remember
6	Represent any two fuzzy set operation using Venn diagram.	CO3	BTL 2	Understand
7	Give Short notes on scalar cardinality	CO3	BTL 1	Remember
8	How do you determine fuzzy cardinality	CO3	BTL 3	Apply
9	What is meant by crossover point in a fuzzy set?	CO3	BTL 1	Remember
10	What is fuzzy inference system?	CO3	BTL 5	Evaluate
11	Draw the intersection of two fuzzy sets.	CO3	BTL 4	Analyze
12	Define the union of fuzzy sets.	CO3	BTL 1	Remember
13	Explain the difference between conventional control and fuzzy control system.	CO3	BTL 2	Understand
14	Classify the methods of defuzzification?	CO3	BTL 2	Understand
15	Explain Centre of gravity method of defuzzification.	CO3	BTL 3	Apply
16	What is approximate reasoning?	CO3	BTL 4	Analyze
17	Write the classifications of Fuzzy Logic control?	CO3	BTL 2	Understand
18	State Sugeno's complement operation.	CO3	BTL 6	Create
19	Which are called as equilibrium points?	CO3	BTL 2	Understand
20	Justify the composition of two binary fuzzy relations.	CO3	BTL 5	Evaluate
21	State fuzzy cylindrical extension.	CO3	BTL 3	Apply
22	Why membership function is used?	CO3	BTL 3	Apply
23	List out the different forms of membership function.	CO3	BTL 5	Evaluate
24	Which membership function is appropriate in fuzzy system?	CO3	BTL 4	Analyze

PART – B

1	State and explain properties of fuzzy sets with example. (13)	CO3	BTL 5	Evaluate

2	Calculate (i) Complement (ii) Union (iii) Intersection (iv) Difference (v) De Morgan's Principles for the two given fuzzy sets $\boldsymbol{A}=\{\mathbf{12+\ 0.34+0.56+0.28}\}$ $\boldsymbol{B}=\{\mathbf{0.52+\ 0.44+0.16+18}\}$	CO3	BTL 4	Analyze
3	(i)Explain with neat block diagram the various components of a fuzzy logic system. (8) (ii)Describe shortly on Centroid method. (5)	CO3	BTL 2	Understand
4	(i)Find the power set and cardinality of the given set X={2,4,6}. Also find cardinality of power set. (ii) Compare conventional control and fuzzy control system. (13)	CO3	BTL 3	Apply
5	Enumerate the properties of fuzzy sets. (13)	CO3	BTL 2	Understand
6	(i) Discuss the methods of aggregation of fuzzy rules. (ii) Write short notes on fuzzy propositions. (13)	CO3	BTL 1	Remember
7	Consider two fuzzy sets A={0.2/1+0.3/2 + 0.4/3 +0.5/4} B={0.1/1+0.2/2+0.2/3+1/4} Find the algebraic sum, algebraic product, bounded sum and bounded difference of the given fuzzy sets. (13)	CO3	BTL 4	Analyze
8	Explain in detail about the basic features of the membership functions. (13)	CO3	BTL 2	Understand
9	Describe the self-organizing Fuzzy Logic Control scheme with a suitable example. Mention its advantages over fuzzy logic controller. (13)	CO3	BTL 3	Apply
10	Explain the algebraic sum, algebraic product, bounded sum and bounded product operations on Fuzzy Set. (13)	CO3	BTL 6	Create
11	Explain with neat block diagram the various components and operation of a fuzzy logic system. (13)	CO3	BTL 1	Remember
12	Describe in detail on Fuzzy Composition. (13)	CO3	BTL 1	Remember
13	Consider the following Two fuzzy sets: A = { $0.3/x_1 + 0.7/x_2 + 1/x_3$ } B = { $0.4 / y_1 + 0.9 / y_2$ } Perform the Cartesian product over these given fuzzy sets. (13)	CO3	BTL 2	Understand
14	(i)Using own intuition and definition of the universe of discourse, plot fuzzy membership functions for " weight of people". (7) (ii)Using own intuition, plot the fuzzy membership function for the age of people. (6) .	CO3	BTL 3	Apply
15	Explain the different types of membership function used in fuzzification process? (13)	CO3	BTL 5	Evaluate
16	Justify the Operations on Fuzzy Relations. (13)	CO3	BTL 1	Remember

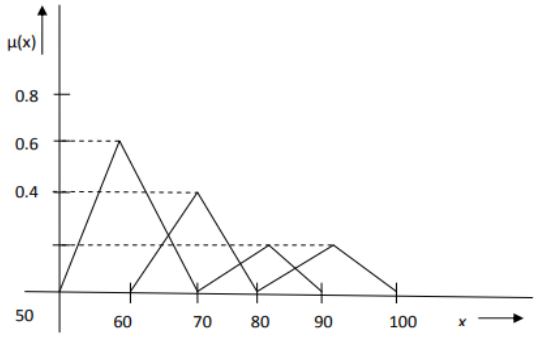
17	What is the difference between cylindrical extension and projection? Explain in detail about the cylindrical extension. (13)	CO3	BTL 4	Analyze
	PART – C			
1	The discretized membership functions for a transistor and a resistor are given below: μT = { 0/0+0.2/1+0.7/2+0.8/3+0.9/4+1/5} μR= {0/0+ 0.1/1+ 0.3/2+ 0.2/3+ 0.4/4+ 0.5/5} Find the following (i) Algebraic sum (ii) Algebraic product (iii) Bounded sum (iv) Bounded difference . (15)	CO3	BTL 6	Create
2	Explain with neat block diagram the various components and operation of a fuzzy logic system. (15)	CO3	BTL 6	Create
3	Design a computer software to perform image processing to locate objects within a scene. The two fuzzy sets representing a plane and a train image etc., (15) Plane = 0.2 + 0.5 + 0.3 + 0.8 + 0.1 Train bike boat plane house Train = 1 + 0.2 + 0.4 + 0.5 + 0.2 Train bike boat plane house Find the Following (a) Plane U Train (b) Plane Ո Train (c) ------ (d) ----- (e) Plane | Train (f) ---------- Plane Train Plane U Train	CO3	BTL 5	Evaluate
4	Using the inference approach, find the membership values for the triangular shapes *I,R,E,IR* and T for a triangle with angles 45°,55° and 80°. (15)	CO3	BTL 5	Evaluate
5	Consider four travel packages offered by Celtic, Club Mahindra, Metro and Himalaya travels. We want to choose one. Their costs are INR 100,000, INR 200,000 , INR 150,000 and INR 175,000. Their travel time in hours are 150, 200, 100 and 125 respectively. They are viewed as interesting with degress 0.4, 0.3, 0.6 and 0.5. Define your own fuzzy set of acceptable travel times. Then determine the fuzzy sets of interesting travel packages whose cost and travel times are acceptable and use this set to choose one of your packages. (15)	CO3	BTL 5	Evaluate

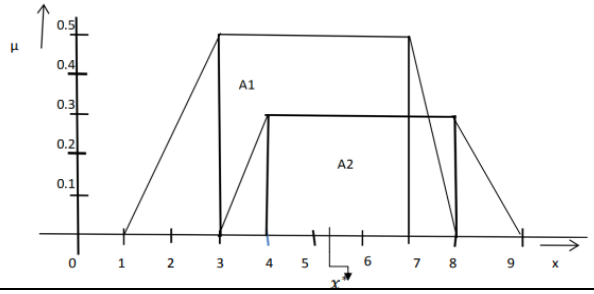
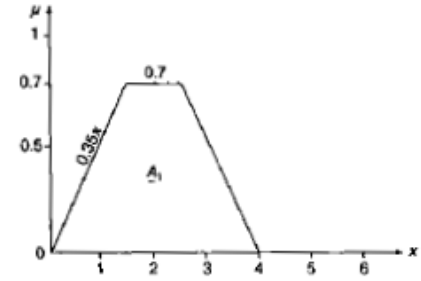
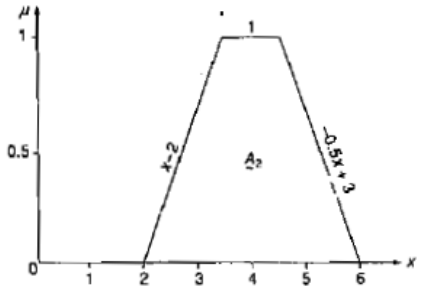
Unit IV - Fuzzy Logic For Modeling And Control

Modelling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification – Adaptive fuzzy systems – Familiarization with fuzzy logic toolbox.

PART – A

Q.No	Questions	Course Outcome	BT Level	Competence
1	Why Modelling of non-linear systems using Fuzzy model is done?	CO4	BTL-6	Create
2	Is Fuzzy logic Nonlinear?	CO4	BTL-2	Understand
3	What is TSK model?	CO4	BTL-6	Create
4	Mention the advantages of Sugeno Model.	CO4	BTL-1	Remember
5	Draw the general block diagram of Fuzzy Logic control	CO4	BTL-1	Remember
6	List the classification of Fuzzy Logic control.	CO4	BTL-1	Remember
7	State some applications of FLC.	CO4	BTL-4	Analyze
8	Mention the features of FLC.	CO4	BTL-5	Evaluate
9	What is called fuzzification?	CO4	BTL-2	Understand
10	Classify the fuzzification methods.	CO4	BTL-3	Apply
11	Give short notes on fuzziness in soft computing.	CO4	BTL-1	Remember
12	Justify the term defuzzification.	CO4	BTL-1	Analyze
13	Why Defuzzification is important?	CO4	BTL-4	Analyze
14	What are the methods of defuzzification process?	CO4	BTL-3	Apply
15	State the principle of center of gravity method of defuzzification.	CO4	BTL-1	Remember
16	Mention the three properties for matrix relations that define fuzzy equivalence relation.	CO4	BTL-2	Understand
17	What is the role of knowledge base in fuzzy logic?	CO4	BTL-2	Understand
18	List out the advantages of fuzzy logic in Knowledge base systems.	CO4	BTL-5	Evaluate
19	Distinguish between conventional control and fuzzy control system.	CO4	BTL-3	Apply
20	What are adaptive fuzzy systems?	CO4	BTL-3	Apply
21	When to go for fuzzy logic based modeling scheme?	CO4	BTL-2	Understand
22	Mention the features of adaptive fuzzy systems.	CO4	BTL-5	Evaluate

23	Outline the applications of adaptive fuzzy systems.	CO4	BTL-4	Analyze
24	What is fuzzy logic tool box?	CO4	BTL-4	Analyze
	PART – B			
1	State the importance of modelling of nonlinear systems. (13)	CO4	BTL-1	Remember
2	State the differences between Mamdani and Sugeno Fuzzy Inference System. (13)	CO4	BTL-4	Analyze
3	Explain Sugeno-Type Fuzzy Inference in detail. (13)	CO4	BTL-6	Create
4	Define defuzzification and explain the different defuzzification methods. (13)	CO4	BTL-1	Remember
5	Enumerate the difference between Fuzzification and Defuzzification. (13)	CO4	BTL-3	Apply
6	Explain fuzzy associate memory (FAM) with a suitable example. (13)	CO4	BTL-4	Analyze
7	List out the importance of the neuro fuzzy controller in other fields. (13)	CO4	BTL-4	Analyze
8	What are the components of fuzzy logic control and explain them in detail with block diagram? (13)	CO4	BTL-2	Understand
9	What are the steps involved in Fuzzy logic decision making and explain the types of decision? (13)	CO4	BTL-1	Remember
10	Explain in detail any one application of neuro fuzzy techniques in power systems. (13)	CO4	BTL-2	Understand
11	List out the various steps involved in the design of Fuzzy Logic Controller. (13)	CO4	BTL-2	Understand
12	Describe the two different FLC system models. (13)	CO4	BTL-1	Remember
13	Explain the Weighted average method and determine the defuzzified value using the same for the following, (13) 	CO4	BTL-3	Apply
14	Explain in detail about the knowledge base for fuzzy logic systems. (13)	CO4	BTL-5	Evaluate

15	Explain min-max method of implication with a suitable example. (13)	CO4	BTL-2	Understand
16.	Find the defuzzified value of the following using the method of Centre of sums and centre of gravity method (13) 	CO4	BTL-3	Apply
17.	With a suitable application case study, explain fuzzy logic controller. (13)	CO4	BTL-5	Evaluate
	PART - C			
1	Explain the various ways by which membership values can be assigned to fuzzy variables.(15)	CO4	BTL-5	Evaluate
2	Explain the TSK Model with an Example.(15)	CO4	BTL-5	Evaluate
3	For the given membership function *as* shown below, determine the defuzzified output value by a. Centroid Method b. Weighted Average Method. c. Mean Max Method.  	CO4	BTL-6	Create
4	Describe in detail about the Adaptive Fuzzy Sytems.(15)	CO4	BTL-5	Evaluate
5	Briefly explain about the Familiarization with fuzzy logic toolbox.(15)	CO4	BTL-6	Create

Unit V - Hybrid Control Schemes

Genetic Algorithms and Genetic Programming- Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron– GA – Optimization of membership function and rule base using Genetic Algorithm –Case study – Familiarization with ANFIS toolbox.

PART – A

Q.No	Questions	Course Outcome	BT Level	Competence
1	What is called hybrid intelligent control?	CO5	BTL-1	Remember
2	List few applications of Neuro fuzzy systems.	CO5	BTL-2	Understand
3	Write the applications of Particle Swarm Optimization	CO5	BTL-6	Apply
4	Define Support Vector Machine.	CO5	BTL-1	Remember
5	What are the properties of SVM?	CO5	BTL-1	Remember
6	Mention the advantages and disadvantages of SVM.	CO5	BTL-4	Analyze
7	Write the similarities and dissimilarities of PSO and GA	CO5	BTL-4	Analyze
8	Define fuzzy logic controller.	CO5	BTL-5	Evaluate
9	Name any two search techniques used for solving optimizations problem	CO5	BTL-2	Understand
10	Differentiate between Perceptron and SVM.	CO5	BTL-3	Apply
11	What is the purpose of toolboxes in MATLAB?	CO5	BTL-4	Analyze
12	List few applications of hybrid fuzzy Genetic algorithm systems.	CO5	BTL-3	Apply
13	Define fuzzy logic controller.	CO5	BTL-4	Analyze
14	Write a few NN readily available in MATLAB tool box	CO5	BTL-3	Apply
15	Name the Kernels used in SVM classification process.	CO5	BTL-1	Remember
16	Mention few evolutionary programming techniques.	CO5	BTL-2	Understand
17	What are the parameters selected when implementing Fuzzy Logic Control using MATLAB?	CO5	BTL-6	Create
18	What are the transfer functions available in MATLAB neural network toolbox?	CO5	BTL-5	Evaluate
19	Give the defuzzification methods available in MATLAB tool box.	CO5	BTL-2	Understand
20	List few applications of Neuro fuzzy systems.	CO5	BTL-2	Understand
21	Classify the shapes of the membership function available in fuzzy logic tool box.	CO5	BTL-3	Apply
22	Compare Fuzzy Processing and Neural Processing	CO5	BTL-1	Remember
23	Mention the characteristics of neuro-fuzzy hybrid systems	CO5	BTL-1	Remember
24	Compare Fuzzy Processing and Neural Processing	CO5	BTL-5	Evaluate

PART – B

1	Explain any two hybrid control schemes. (13)	CO5	BTL-1	Remember
2	With suitable block diagram, explain the principle involved in a liquid level controller using neurofuzzy technique. (13)	CO5	BTL-4	Analyze
3	Explain in detail the concept of fuzzy genetic hybrid systems. (13)	CO5	BTL-6	Create
4	Describe the architecture and algorithm of Support Vector machines. (13)	CO5	BTL-3	Apply
5	(i) Differentiate between linear SVM and Kernel SVM. (7) (ii) Explain with different kernels used in SVM. (6)	CO5	BTL-3	Apply
6	(i) Differentiate between linear SVM and Kernel SVM. (7) (ii) Explain with different kernels used in SVM. (6)	CO5	BTL-4	Analyze
7	Explain how fuzzy logic control can be used for process control.(13)	CO5	BTL-4	Analyze
8	What are the classifications of neuro-fuzzy hybrid systems? Explain in detail any one of the neuro-fuzzy hybrid systems.(13)	CO5	BTL-2	Understand
9	With a neat flowchart, explain the algorithm of particle swarm optimization.(13)	CO5	BTL-1	Remember
10	(i) Compare and Contrast—Genetic Algorithm and Particle Swarm Optimization. (6) (ii) Compare and contrast – Perceptron and Support Vector Machines.	CO5	BTL-1	Remember
11	How are genetic algorithm utilized for optimizing the weights in neural network architecture. (13)	CO5	BTL-2	Understand
12	What is called ANFIS? Draw the architecture of ANFIS network and represent the role of different layers. (13)	CO5	BTL-1	Remember
13	Write short notes on the following: i) Stability analysis of NN interconnected systems (8) ii) Stability analysis	CO5	BTL-2	Understand
14	Describe the architecture and algorithm of Support Vector machines. (13)	CO5	BTL-5	Evaluate
15	Describe briefly the modelling and implementation of fuzzy logic controller for any one application. (13)	CO5	BTL-3	Apply

16	(i) Differentiate between linear SVM and Kernel SVM. (7) (ii) Explain with different kernels used in SVM. (6)	CO5	BTL-5	Evaluate
17	Explain in detail the concept of fuzzy genetic hybrid systems. (13)	CO5	BTL-2	Understand
PART – C				
1	How to implement particle swarm optimization for traveling salesman problem?(15)	CO5	BTL-6	Create
2	Show how fuzzy logic control and genetic algorithm based structural optimization can be used for plant control applications?(15)	CO5	BTL-5	Evaluate
3	Explain the case study of the application of neural network for stability analysis of interconnected systems.(15)	CO5	BTL-5	Evaluate
4	For choice of your application, design and train the SVM network with different kernels and classify them.(15)	CO5	BTL-5	Evaluate
5	(i) Compare and Contrast—Genetic Algorithm and Particle Swarm Optimization. (6) (ii) Compare and contrast – Perceptron and Support Vector Machines	CO5	BTL-5	Evaluate