SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203.

DEPARTMENT OF

ELECTRONICS AND INSTRUMENTATION ENGINEERING

M.E. CONTROL AND INSTRUMENTATION ENGINEERING

QUESTION BANK

II SEMESTER

1913210-SOFT COMPUTING TECHNIQUES

Regulation-2019

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Prepared by

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M.E CONTROL AND INSTRUMENTATION ENGINEERING

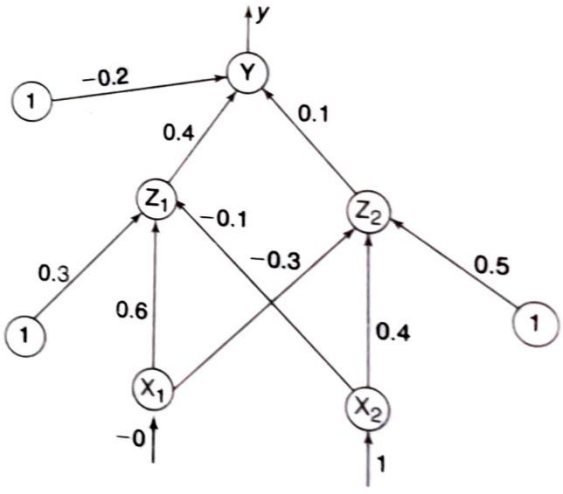
SUBJECT: 1913210-SOFT COMPUTING TECHINIQUES

SEM/YEAR: II/ I M.E (C& I)

QUESTION BANK

UNIT I - INTRODUCTION AND ARTIFICIAL NEURAL NETWORKS			
Introduction to intelligent systems- Soft computing techniques- Conventional Computing versus Swarm Computing - Classification of meta-heuristic techniques - Properties of Swarm intelligent Systems - Application domain - Discrete and continuous problems - Single objective and multi-objective problems -Neuron- Nerve structure and synapse- Artificial Neuron and its model- activation functions- Neural network architecture- single layer and multilayer feed forward networks-Mc Culloch Pitts neuron model- perceptron model- Adaline and Madaline- multilayer perception model- back propagation learning methods- effect of learning rule coefficient -back propagation algorithm- factors affecting back propagation training- applications.			
PART – A			
Q. No	**Questions**	**BTL Level**	**Competence**
1.	Define soft computing technology and list few techniques.	**BTL 1**	**Remember**
2.	Compare soft computing vs. hard computing.	**BTL 3**	**Apply**
3.	Justify Swarm intelligence is superior to conventional computing algorithm.	**BTL 5**	**Evaluate**
4.	Sketch the model of artificial neuron.	**BTL 2**	**Understand**
5.	Distinguish between artificial neuron & biological neuron.	**BTL 2**	**Understand**
6.	State the function of synapse.	**BTL 2**	**Understand**
7.	Define an artificial neural network.	**BTL 1**	**Remember**
8.	Name some activation functions used in ANN.	**BTL 1**	**Remember**
9.	Define net architecture and give its classification.	**BTL 1**	**Remember**
10.	Write the expression for binary and bipolar sigmoid activation function.	**BTL 1**	**Remember**
11.	Categorize single layer net and multilayer net.	**BTL 3**	**Apply**
12.	Why is the McCulloch Pitts neuron widely used in logic functions?	**BTL 3**	**Apply**
13.	What is the significance of error signal in perceptron network?	**BTL 2**	**Understand**

14.	Draw the basic model of Adaline network and Madaline network.	**BTL 6**	**Create**
15.	Draw the architecture of back propagation algorithm.	**BTL 6**	**Create**
16.	Distinguish between supervised learning and unsupervised learning algorithm.	**BTL 4**	**Analyze**
17.	What is a back propagation NN?	**BTL 1**	**Remember**
18.	What are the factors affecting back propagation training?	**BTL 4**	**Analyze**
19.	State the techniques for proper choice of learning rate.	**BTL 5**	**Evaluate**
20.	For derivative-based learning procedure why a sigmoidal function is used instead of a step function?	**BTL 4**	**Analyze**
	PART-B		
1.	Draw the functional block diagram of swarm intelligence system, explain the role of sub blocks. Also represent the properties and application domain of swarm intelligence system. **(13)**	**BTL 3**	**Apply**
2.	**(i)** What are the applications of soft computing techniques? **(5)** **(ii)** Differentiate the features of soft computing and hard computing. **(8)**	**BTL 1**	**Remember**
3.	Draw and describe the structure of a biological neuron. **(13)**	**BTL 1**	**Remember**
4.	**(i)** Differentiate between biological neuron and artificial neuron on the basis of a structure and function of a single neuron. **(6)** **(ii)** Draw a simple artificial neuron and discuss the calculation of net input. **(7)**	**BTL 2**	**Understand**
5.	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)**	**BTL 1**	**Remember**
6.	Using McCulloch-Pitts neuron model, design a neural network for 2-input XOR functions. **(13)**	**BTL 4**	**Analyze**
7.	**(i)** Explain the single perceptron with its learning algorithm and its seperability and convergence property. **(7)** **(ii)** Determine the weights of a single layer perceptron for implementing the AND function. Consider the inputs and targets to be bipolar and $\alpha=1$. **(6)**	**BTL 5**	**Evaluate**
8.	**(i)** Explain the training algorithm used in Adaline network. **(6)** **(ii)** How is training adopted in Madaline network using majority vote rule? **(7)**	**BTL 4**	**Analyze**

9.	Using Adaline network to train ANDNOT function with bipolar inputs and targets. Perform 2 epochs of training. **(13)**	**BTL 6**	**Create**
10.	Explain with a neat diagram the neural network architecture of multilayer feed forward network. **(13)**	**BTL 1**	**Remember**
11.	Explain the working of back propagation neural network with neat architecture and flowchart. **(13)**	**BTL 2**	**Understand**
12.	**(i)** Explain linear separability. Why can be a single layer of perceptron not be used to solve linear inseparable problems? **(7)** **(ii)** Implement OR function with binary input and bipolar target using perceptron training algorithm up to three epochs. **(6)**	**BTL 4**	**Analyze**
13.	Explain the architecture and algorithm of standard back propagation algorithm. **(13)**	**BTL 2**	**Understand**
14.	Discuss the back propagation learning methods and algorithm in detail. **(13)**	**BTL 3**	**Apply**
	PART-C		
1.	Can a two input Adaline compute the XOR function? Analyze the XOR function using Madaline. **(15)**	**BTL 5**	**Evaluate**
2.	A two-layer neural network has two neurons in each layer, three inputs, including an augmentation input and two outputs. With back propagation algorithm, how will you find weights, slopes, error signals, outputs and the updated weight? Also, mention the features and limitations with back propagation network. **(15)**	**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)** 	**BTL 6**	**Create**

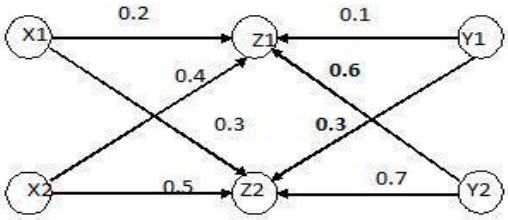
4.	Find the weights requires to perform the following classification using perceptron network. The vectors (1, 1, 1, 1) and (-1, 1, -1, -1) are belong to the class (so have target value 1) and vectors (1, 1, 1, -1) and (1, -1, -1, 1) are not belonging to class (so have target value -1). Assume learning rate as '1' & initial weight as '0'. **(15)**	**BTL6**	**Create**

UNIT-II
ARTFICIAL NEURAL NETWORKS AND ASSOCIATIVE MEMORY

Counter propagation network (CPN) - architecture- functioning & characteristics of counter-Propagation network-Hopfield/ Recurrent network- configuration- stability constraints-associative memory-and characteristics- limitations and applications- Hopfield v/s Boltzmann machine- Adaptive Resonance Theory (ART) - Architecture- classifications- Implementation and training-Associative Memory.

PART – A

Q. No	Questions	BTL Level	Competence
1.	Mention the characteristics of counter propagation network.	**BTL 2**	**Understand**
2.	Write the principle involved in learning vector quantization.	**BTL 3**	**Apply**
3.	What is a Hopfield net?	**BTL 1**	**Remember**
4.	Why Hopfield network is called as recurrent neural network?	**BTL 3**	**Apply**
5.	Distinguish between recurrent and non-recurrent networks.	**BTL 4**	**Analyze**
6.	What is meant by associative memory and hetero -associative memory?	**BTL 1**	**Remember**
7.	State the advantages of associative memory.	**BTL 2**	**Understand**
8.	What are the limitations of associative memory network?	**BTL 1**	**Remember**
9.	What is Boltzmann machine and applications of Boltzmann machine?	**BTL 3**	**Apply**
10.	Name some applications of competitive learning network.	**BTL 4**	**Analyze**
11.	What is meant by winners-takes- all?	**BTL 5**	**Evaluate**
12.	Mention the important feature of Kohonen self-organizing network.	**BTL 2**	**Understand**
13.	What is the principle strength of competitive learning?	**BTL6**	**Create**
14.	Define stability and plasticity.	**BTL 1**	**Remember**
15.	Differentiate between ART networks and CPN networks.	**BTL 4**	**Analyze**
16.	What are the properties of adaptive resonance theory?	**BTL 1**	**Remember**
17.	Mention the three components of an ART network.	**BTL 2**	**Understand**

18.	Mention any two applications of ART Network.	**BTL 1**	**Remember**
19.	How degree of similarity is controlled in ART network?	**BTL6**	**Create**
20.	Justify why Artificial Neural Network is called adaptive system during training.	**BTL 5**	**Evaluate**
	PART-B		
1.	Develop and describe with a neat diagram the counter propagation network learning algorithm. **(13)**	**BTL 1**	**Remember**
2.	Explain briefly the full counter propagation with architecture and its functioning. **(13)**	**BTL 2**	**Understand**
3.	Consider the following full counter propagation network (CPN) shown in below figure using input pair $x(1,1)$ and y $(0,1)$; perform first phase of training (One step only). Find the activation of the cluster layer units and update the weights using learning rates of 0.3.  **(13)**	**BTL 5**	**Evaluate**
4.	**(i)** Draw the architecture of full counter propagation network and represent the active units in the first and second phase of counter propagation training. **(7)** **(ii)** Explain how training a counter propagation network occurs in two phases. **(6)**	**BTL 1**	**Remember**
5.	Describe with a neat diagram the architecture of recurrent network to perform XOR task with two inputs. **(13)**	**BTL 4**	**Analyze**
6.	Describe the architectural functions and characteristics of Hopfield Network. **(13)**	**BTL 1**	**Remember**
7.	**(i)** Describe the steps involved to solve any one of the optimization problems using Hopfield neural network. **(7)** **(ii)** State the problem clearly and explain the mapping of the same to the Hopfield network. **(6)**	**BTL 4**	**Analyze**
8.	With neat architecture, explain the training algorithm of Kohonen self-organizing feature maps. **(13)**	**BTL 2**	**Understand**
9.	**(i)** Draw and explain the structure of Boltzmann machine. **(7)** **(ii)** Discuss about the learning process in Boltzmann machine. **(6)**	**BTL3**	**Apply**

10.	Explain basic architecture, working and analysis of adaptive resonance theory. (ART-1) **(13)**	**BTL 4**	**Analyze**
11.	Explain the training algorithm used in ART network. **(13)**	**BTL 2**	**Understand**
12.	Explain characteristic features, limitations and applications of associative memory. **(13)**	**BTL 1**	**Remember**
13.	Consider the two pairs of patterns with bipolar symbols A_1= (+1, +1, -1) and B_1= (-1, +1, -1, +1); A_2= (+1, -1, +1) and B_2= (+1, -1, +1, -1). Calculate the weights for $2\ X\ 2$ Bidirectional associative memory. (BAM) **(13)**	**BTL 6**	**Create**
14.	Construct and test a hetero associative memory net to store the given vector pairs: S (1) = (0 0 0 1), t (1) = (0 1) S (2) = (0 0 1 1), t (2) = (0 1) S (3) = (0 1 0 0), t (3) = (1 0) S (4) = (1 1 0 0), t (4) = (1 0) Also test the network with "noisy" input patterns. **(13)**	**BTL3**	**Apply**
	PART-C		
1.	Make an analysis of energy function of continuous Hopfield network. **(15)**	**BTL 6**	**Create**
2.	Construct an auto associative network to store the vectors $x_1 = [1 \quad 1 \quad 1 \quad 1 \quad 1]$, $x_2 = [1 \quad -1 \quad -1 \quad 1 \quad -1]$, $x_3 = [-1 \quad 1 \quad -1 \quad -1 \quad -1]$. Find weight matrix with no self-connection. Calculate the energy of the stored patterns. Using discrete Hopfield network test patterns if the test patterns are given as $x_1 = [1 \quad 1 \quad 1 \quad -1 \quad 1]$, $x_2 = [1 \quad -1 \quad -1 \quad -1 \quad -1]$, $x_3 = [1 \quad 1 \quad -1 \quad -1 \quad -1]$. Compare the test patterns energy with stored energy patterns. **(15)**	**BTL 5**	**Evaluate**
3.	Analyse the Training and Testing operation of a Recurrent Neural Network. **(15)**	**BTL 6**	**Create**
4.	Consider an ART 1 network with four F_1 units and three F_2 units. Assume the initial weights as follows: Bottom up weights (b_{ij}): $\begin{bmatrix} 0.67 & 0 & 0.2 \\ 0 & 0 & 0.2 \\ 0 & 0 & 0.2 \\ 0 & 0.67 & 0.2 \end{bmatrix}$ and	**BTL 5**	**Evaluate**

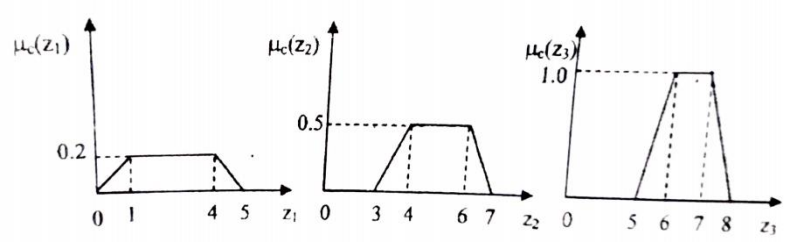
	Top down weights (t_{ij}): $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$ Determine the new weight matrices after the vector [0, 0, 1, 1] is presented, if the vigilance parameter is given as 0.3 and 0.7. **(15)**		

UNIT-III
FUZZY LOGIC SYSTEM

Introduction to crisp sets and fuzzy sets- basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control- Fuzzification- inferencing and defuzzification- Fuzzy knowledge and rule bases-Fuzzy modeling and control schemes for nonlinear systems. Self-organizing fuzzy logic control- Fuzzy logic control for nonlinear time delay system.

PART – A

Q. No	Questions	BTL Level	Competence
1.	How does a fuzzy set differ from crisp set?	**BTL 5**	**Evaluate**
2.	What is cardinality of a Fuzzy set? Whether a power set can be formed for a fuzzy set?	**BTL3**	**Apply**
3.	What is an empty Fuzzy set and height of a Fuzzy set?	**BTL2**	**Understand**
4.	Justify the following statement: 'Partial membership is allowed in fuzzy sets'.	**BTL3**	**Apply**
5.	Represent any two fuzzy set operation using Venn diagram.	**BTL 6**	**Create**
6.	What is meant by crossover point in a fuzzy set?	**BTL2**	**Understand**
7.	What is approximate reasoning?	**BTL1**	**Remember**
8.	What is fuzzy inference system?	**BTL2**	**Understand**
9.	State the cartesian product of a relation.	**BTL1**	**Remember**
10.	State the principle of center of gravity method of defuzzification.	**BTL1**	**Remember**
11.	What are the methods of defuzzification process?	**BTL2**	**Understand**
12.	What is the difference between centroid method and center of largest area method?	**BTL 4**	**Analyze**
13.	How is a fuzzy relation converted into a crisp relation using lamda-cut process?	**BTL 6**	**Create**
14.	What is called fuzzification?	**BTL1**	**Remember**
15.	What are the steps involved in designing a fuzzy logic controller?	**BTL1**	**Remember**
16.	Distinguish between conventional control and fuzzy control system.	**BTL 4**	**Analyze**

17.	What is the difference between fuzzy logic and binary logic?	**BTL 4**	**Analyze**
18.	List the classification of Fuzzy Logic control.	**BTL1**	**Remember**
19.	When to go for fuzzy logic based modeling scheme?	**BTL 5**	**Evaluate**
20.	Mention the three properties for matrix relations that define fuzzy equivalence relation.	**BTL3**	**Apply**
	PART-B		
1.	State and explain properties of fuzzy sets with example. **(13)**	**BTL1**	**Remember**
2.	Calculate (i) Complement (ii) Union (iii) Intersection (iv) Difference (v) De Morgan's Principles for the two given fuzzy sets $\underline{A} = \left\{\frac{1}{2} + \frac{0.3}{4} + \frac{0.5}{6} + \frac{0.2}{8}\right\}$ $\underline{B} = \left\{\frac{0.5}{2} + \frac{0.4}{4} + \frac{0.1}{6} + \frac{1}{8}\right\}$ **(13)**	**BTL 5**	**Evaluate**
3.	Compare the following two fuzzy relations R_1 and R_2 using max-min and max-product compositions: $\begin{bmatrix} R_1 & y_1 & y_2 & y_3 & y_4 \\ x_1 & 0.3 & 0 & 0.7 & 0.3 \\ x_2 & 0 & 1 & 0.2 & 0 \end{bmatrix}$ $\begin{bmatrix} R_2 & z_1 & z_2 & z_3 \\ y_1 & 0.1 & 0.2 & 0.4 \\ y_2 & 0.8 & 0.3 & 1 \\ y_3 & 0.7 & 0.9 & 0.6 \\ y_4 & 1 & 0.2 & 0.1 \end{bmatrix}$ **(13)**	**BTL 4**	**Analyze**
4.	Explain the different types of membership function used in fuzzification process. **(13)**	**BTL3**	**Apply**
5.	The results of three implication processes arc as shown in fig. Find the aggregated output and the defuzzified output using the (i) Center of gravity (ii) Center of sums and (iii) Weighted average methods  **(13)**	**BTL 4**	**Analyze**
6.	**(i)** Differentiate between Mamdani FIS and Sugeno FIS. **(5)** **(ii)** The membership functions for the linguistic variables "Tall" and "Short" are given below.	**BTL2**	**Understand**

	$$\text{"Tall"} = \left\{\frac{0.2}{5} + \frac{0.3}{7} + \frac{0.7}{9} + \frac{0.9}{11} + \frac{1.0}{12}\right\}$$ $$\text{"Short"} = \left\{\frac{0.3}{0} + \frac{0}{30} + \frac{1}{60} + \frac{0.5}{90} + \frac{0}{120}\right\}$$ Describe the membership functions for the following linguistic phrases. (i) Very tall (ii) fairly tall (iii) not very short **(8)**		
7.	The discretized membership functions for a transistor and a resistor are given below: $\mu_T = \{0/0 + 0.2/1 + 0.7/2 + 0.8/3 + 0.9/4 + 1/5\}$ $\mu_R = \{0/0 + 0.1/1 + 0.3/2 + 0.2/3 + 0.4/4 + 0.5/5\}$ Find the following (i) Algebraic sum (ii) Algebraic product (iii) Bounded sum (iv) Bounded difference **(13)**	**BTL 4**	**Analyze**
8.	**(i)** Discuss the methods of aggregation of fuzzy rules. **(8)** **(ii)** Write short notes on fuzzy propositions. **(5)**	**BTL1**	**Remember**
9.	**(i)** Discuss about the four modes of fuzzy reasoning. **(6)** **(ii)** With suitable block diagram, explain the working principle of fuzzy inference system. **(7)**	**BTL2**	**Understand**
10.	Explain with neat block diagram the various components and operation of a fuzzy logic system. **(13)**	**BTL1**	**Remember**
11.	Discuss the design of FLC of a typical non-linear systems. **(13)**	**BTL6**	**Create**
12.	With a suitable application case study explain a fuzzy logic controller. **(13)**	**BTL3**	**Apply**
13.	With a suitable diagram, explain the types and working of fuzzy inference system. **(13)**	**BTL2**	**Understand**
14.	Explain the principle of self-organizing fuzzy logic control. Mention its advantages over fuzzy logic controller. **(13)**	**BTL1**	**Remember**
	PART-C		
1.	Given a conditional and qualified Fuzzy proposition 'P' of the form. P: If x is A, then y is B is S where 'S' is fuzzy truth qualifier and a fact is in the form "x is A". We want to make an inference in the form "y is B". Develop a method based on the truth- value restrictions for getting the inference. **(15)**	**BTL 5**	**Evaluate**
2.	Design the general scheme for a Fuzzy controller. How different modules are interconnected? Deploying the above how will you solve the problem of stabilizing the inverted pendulum? **(15)**	**BTL6**	**Create**

3.	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 degrees 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)**	**BTL 5**	**Evaluate**
4.	Design a fuzzy logic controller to simulate a temperature control system for a room. **(15)**	**BTL6**	**Create**

UNIT IV
GENETIC ALGORITHM

Evolutionary programs – Genetic algorithms, genetic programming and evolutionary programming - Genetic Algorithm versus Conventional Optimization Techniques - Genetic representations and selection mechanisms; Genetic operators- different types of crossover and mutation operators - Optimization problems using GA-discrete and continuous - Single objective and multi-objective problems - Procedures in evolutionary programming.

PART – A

Q.No	Questions	BTL Level	Competence
1.	What are the basic Genetic Algorithm Operators?	**BTL1**	**Remember**
2.	How does Genetic Algorithm differ from traditional algorithm?	**BTL5**	**Evaluate**
3.	Differentiate between Genetic Algorithm and Genetic Programming.	**BTL4**	**Analyze**
4.	State the importance of evolutionary programming.	**BTL2**	**Understand**
5.	Define search space.	**BTL1**	**Remember**
6.	Mention certain applications of Genetic Algorithm.	**BTL2**	**Understand**
7.	What is Roulette wheel selection in GA?	**BTL3**	**Apply**
8.	Mention the role of fitness function in Genetic Algorithm.	**BTL1**	**Remember**
9.	What are the advantages of GA over conventional algorithms?	**BTL3**	**Apply**
10.	Which factors attribute popularity of GA?	**BTL6**	**Create**
11.	How do you select mutation in GA?	**BTL5**	**Evaluate**
12.	Differentiate between phenotype and genotype.	**BTL4**	**Analyze**
13.	List the various types of crossover and mutation techniques in GA.	**BTL2**	**Understand**
14.	Define one point crossover.	**BTL1**	**Remember**
15.	Give examples to illustrate various crossover techniques.	**BTL2**	**Understand**

16.	Differentiate between Roulette wheel selection and tournament selection.	**BTL4**	**Analyze**
17.	List few termination search condition of genetic algorithm.	**BTL1**	**Remember**
18.	What are the five preparatory steps involved in genetic programming?	**BTL3**	**Apply**
19.	Name some different selection methods in Genetic algorithm.	**BTL1**	**Remember**
20.	In what way if-then rules are used for multiobjective optimization?	**BTL6**	**Create**
	PART-B		
1.	Explain the major components of genetic algorithm with flow chart. **(13)**	**BTL1**	**Remember**
2.	Enumerate the procedure involved in using Genetic Algorithm for optimizing controller parameters. **(13)**	**BTL2**	**Understand**
3.	**(i)** Write down the differences and similarities between genetic algorithm and other traditional methods. **(6)** **(ii)** Mention the role of crossover and mutation in genetic algorithm. **(7)**	**BTL4**	**Analyze**
4.	**(i)** Explain the convergence criteria of genetic algorithm. **(7)** **(ii)** Summarize about Deletion and Duplication. **(6)**	**BTL2**	**Understand**
5.	With an example for each bring out the significance of the following as referred to Genetic Algorithm: (i) Fitness function, (ii) Reproduction, (iii) Roulette wheel selection, (iv) Cross Over, (v) Mutation Operator and (vi) Bitwise operators **(13)**	**BTL3**	**Apply**
6.	Evaluate the various phases of GA to control a non-linear time delay system. **(13)**	**BTL5**	**Evaluate**
7.	Describe the steps involved in unit commitment problem solving using GA application. **(13)**	**BTL3**	**Apply**
8.	Explain the significance of adjustment of free parameters when implementing Genetic Algorithm. (**13)**	**BTL1**	**Remember**
9.	Implement Optimization of Traveling Salesman Problem using Genetic algorithm approach. **(13)**	**BTL6**	**Create**
10.	Summarize the sequential procedures involved in the cross over and reproduction phase of GA with typical examples. **(13)**	**BTL2**	**Understand**
11.	**(i)** Discuss the main components of an evolutionary algorithm. **(7)** **(ii)** Indicate its potential advantages and disadvantages as an optimizer. **(6)**	**BTL4**	**Analyze**

12.	**(i)** Describe the basic steps of Genetic Algorithm used for solving optimization techniques. **(7)** **(ii)** Compare the features of Genetic Algorithm with other optimization techniques. **(6)**	**BTL4**	**Analyze**
13.	Explain the Major components of GA and apply GA to maximize the "Peaks" Functions. **(13)**	**BTL1**	**Remember**
14.	Discuss about multi-objective optimization problem formulation with flowchart. **(13)**	**BTL1**	**Remember**
PART-C			
1.	Explain the procedure involved in using Evolutionary programming for multi-objective problems. **(15)**	**BTL5**	**Evaluate**
2.	Assume a typical control problem of yours and explain the various steps involved in finding a solution using GA. **(15)**	**BTL6**	**Create**
3.	Design, create steps and implement for solving any one multi objective optimization problem of your choice using GA. **(15)**	**BTL5**	**Evaluate**
4.	Let a function $\boldsymbol{f(x) = x^2}$ be defined on the interval [0,31]. Apply Genetic algorithm for determining the maximum of the given function (Assume suitable missing data). **(15)**	**BTL6**	**Create**
UNIT V - HYBRID CONTROL SCHEMES			
Fuzzification and rule base using ANN–Neuro fuzzy systems-ANFIS – Fuzzy Neuron - Optimization of membership function and rule base using Genetic Algorithm –Introduction to Support Vector Machine- Evolutionary Programming-Particle Swarm Optimization - Case study – Familiarization of NN, FLC and ANFIS Tool Box.			
PART – A			
Q. No	**Questions**	**BTL Level**	**Competence**
1.	What is called hybrid intelligent control?	**BTL1**	**Remember**
2.	List few applications of Neuro fuzzy systems.	**BTL1**	**Remember**
3.	Name any two search techniques used for solving optimizations problem.	**BTL6**	**Create**
4.	Write the applications of Particle Swarm Optimization.	**BTL2**	**Understand**
5.	List few applications of hybrid fuzzy Genetic algorithm systems.	**BTL1**	**Remember**
6.	Define Support Vector Machine.	**BTL1**	**Remember**
7.	What are the properties of SVM?	**BTL1**	**Remember**
8.	Mention the advantages and disadvantages of SVM.	**BTL2**	**Understand**
9.	What are the parameters selected when implementing Fuzzy Logic Control using MATLAB?	**BTL6**	**Create**

10.	Write the similarities and dissimilarities of PSO and GA.	**BTL4**	**Analyze**
11.	What are the transfer functions available in MATLAB neural network toolbox?	**BTL5**	**Evaluate**
12.	Give the defuzzification methods available in MATLAB tool box.	**BTL2**	**Understand**
13.	Differentiate between Perceptron and SVM.	**BTL4**	**Analyze**
14.	Classify the shapes of the membership function available in fuzzy logic tool box.	**BTL4**	**Analyze**
15.	What is the purpose of toolboxes in MATLAB?	**BTL3**	**Apply**
16.	Define fuzzy logic controller.	**BTL1**	**Remember**
17.	Write a few NN readily available in MATLAB tool box.	**BTL5**	**Evaluate**
18.	Name the Kernels used in SVM classification process.	**BTL3**	**Apply**
19.	Mention few evolutionary programming techniques.	**BTL2**	**Understand**
20.	Write down at least one unique application area for neural network and fuzzy logic learning process.	**BTL3**	**Apply**
	PART-B		
1.	Explain any two hybrid control schemes. **(13)**	**BTL1**	**Remember**
2.	With suitable block diagram, explain the principle involved in a liquid level controller using neurofuzzy technique. **(13)**	**BTL4**	**Analyze**
3.	Describe the architecture and algorithm of Support Vector machines. **(13)**	**BTL1**	**Remember**
4.	**(i)** Differentiate between linear SVM and Kernel SVM. **(7)** **(ii)** Explain with different kernels used in SVM. **(6)**	**BTL2**	**Understand**
5.	Discuss with relevant diagrams and mathematical expressions how a nonlinear system can be identified and controlled using MATLAB Neural Network Tool box. Choose appropriate example. **(13)**	**BTL3**	**Apply**
6.	With suitable example, explain the method by which membership value assignments are performed using genetic algorithm. **(13)**	**BTL4**	**Analyze**
7.	Using MATLAB Neural Network tool box discuss how will you identify and control the linear and nonlinear dynamic system. **(13)**	**BTL5**	**Evaluate**
8.	Explain in detail the concept of fuzzy genetic hybrid systems. **(13)**	**BTL2**	**Understand**
9.	What are the classifications of neuro-fuzzy hybrid systems? Explain in detail any one of the neuro-fuzzy hybrid systems. **(13)**	**BTL4**	**Analyze**

10.	With a neat flowchart, explain the algorithm of particle swarm optimization. **(13)**	**BTL1**	**Remember**
11.	How are genetic algorithm utilized for optimizing the weights in neural network architecture? **(13)**	**BTL3**	**Apply**
12.	**(i)** Compare and Contrast—Genetic Algorithm and Particle Swarm Optimization. **(6)** **(ii)** Compare and contrast – Perceptron and Support Vector Machines. **(7)**	**BTL2**	**Understand**
13.	What is called ANFIS? Draw the architecture of ANFIS network and represent the role of different layers. **(13)**	**BTL1**	**Remember**
14.	Using MATLAB ANFIS tool box discuss how will you identify and control the linear and nonlinear dynamic system. **(13)**	**BTL6**	**Create**
	PART-C		
1.	How to implement particle swarm optimization for traveling salesman problem? **(15)**	**BTL6**	**Create**
2.	Show how fuzzy logic control and genetic algorithm based structural optimization can be used for plant control applications. **(15)**	**BTL5**	**Evaluate**
3.	Explain the case study of the application of neural network for stability analysis of interconnected systems. **(15)**	**BTL5**	**Evaluate**
4.	For choice of your application, design and train the SVM network with different kernels and classify them. **(15)**	**BTL6**	**Create**