OBJECTIVE:

This subject deals with state space, describing function, phase plane and stability analysis including controllability and observability .it also deals with modern control and optimal control systems.

GROUP-I (SHORT ANSWER TYPE QUESTIONS)

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOME
	UNIT-I		
1	Write short notes on ADALINE Network	Evaluate	1
2	What are the applications of neural network.	Analyze	1
3	Explain the organization of the brain in detail	Remember	1
4	Using MC-Culloch pitts model implement the following logic functions. i. Ex-OR gate. ii. Ex-NOR gate. iii. AND gate. iv. NAND gate.	Understand	1
5	Write short notes on MADALINE Network	Understand	1
6	What is the advantage of having hidden layers in an ANN?	Understand	1
7	How do you justify that brain is a parallel distributed processing system?	Understand	1
8	Explain the following terms with respect to Neural networks. i. Stability. ii. Plasticity. iii. Learning. iv. Architecture.	Remember	2
9	Explain the role of neural networks in Power System Planning.	Understand	1
10	State and explain the generalized delta learning rule applied in back propagation	Understand	1
	UNIT-II		
1	What is the advantage of having hidden layers in an ANN?	Remember	3
2	State the perceptron convergence theorem	Analyze	3
3	Write short notes on Learning Strategy	Analyze	3
4	Write short notes on Knowledge base in fuzzy logic control system.	Analyze	4
5	Write short notes on Decision making logic in fuzzy logic control system	Evaluate	4
6	Explain about learning vector quantization	Understand	4
7	How do you justify that brain is a parallel distributed processing system?	Remember	4

8	Explain the following terms with respect to Neural networks. i. Stability. ii. Plasticity. iii. Learning. iv. Architecture.	Remember	3,4
9	Explain types of Neuron Activation Function	Evaluate	3,4
10	Explain Operations of Artificial Neuron	Remember	4
	UNIT-III		
1	Write short notes on single layer feed-forward network.	Understand	5
2	Define the following terms 1. Pattern 2. Classes/categories 3. Features and pattern space 4. Decision regions and surface.	Understand	5
3	State and explain the generalized delta learning rule applied in back propagation algorithm.	Understand	5
4	With an example explain how a pattern can be trained and classified using discrete perceptron algorithm	Analyze	5
5	Differentiate single layer and multilayer networks.	Understand	5
6	Generate the output of OR function using McCulloch-Pitts Neuron	Understand	5
7	Draw a single layer network with continuous perceptions	Understand	5
8	With neat diagrams discuss the two self-organized feature maps.	Understand	5
9	What is XOR problem? Draw and explain the architectural graph of network for solving the XOR problem.	Analyze	5
10	Write single continuous perception training algorithm(SCPTA).	Remember	5
	UNIT-1V		
1	Explain What are the steps involved in back propagation algorithm?	Understand	6
2	What are the limitations of back propagation algorithm?	Understand	6
3	What is meant by uncertainty	Analyze	6
4	What are various types of uncertainties	Understand	6
5	How is the error back propagated in BPN	Analyze	6
6	Differentiate between local minima and global minima?	Evaluate	6
7	What is credit assignment problem?	Remember	6
8	What is the significant of momentum term in back propagation learning?	Analyze	6
9	State and prove Kolmogorov's theorem.	Evaluate	6
10	Write short notes on Sigmoidal gain.	Remember	6
	UNIT-V		
1	What is Hebbian learning? Explain its role in linear associative?	Evaluate	7
2	Explain address-addressable memory.	Understand	7
3	Define the hamming distance.	Remember	7
4	Discuss memory based learning	Apply	7
5	Explain the block diagram of associative memory?	Remember	7
6	Explain the Hetero-associative memory?	Create	7
7	Explain the Auto-associative memory?	Apply	7
8	Explain associate rules?	Evaluate	7
9	With the help of linear association network diagram. Explain the input	Remember	7
10	Describe the architecture of BAM.	remember	7
	UNIT-VI		
1	Compare and contrast classical set theory and fuzzy set theory.	Understand	8

2	Explain the following: i. Generalized Modus Ponens (GMP). ii. Generalized Modus Tollens (GMT)	Understand	8
3	(a) Describe the geometry of fuzzy sets. (b) Describe the FAM system	Creating	8
4	Let X = {a,b,c,d } Y = {1,2,3,4 } and A˜ = {(a,0)(b,0.8)(c,0.6)(d,1) } B˜ = {(1,0.2)(2,1)(3,0.8)(4,0) } C˜ = {(1,0)(2,0.4)(3,1)(4,0.8) } Determine the implication relations IF x is A˜ THEN y is B˜ . IF x is A˜ THEN y is B˜ ELSE y is C˜ .	Apply	8
5	Define"sensor" connected with fuzzy control system.	Analyse	8
6	Explain in detail any one application of neuro fuzzy techniques in power sys - tems	Apply	9
7	Prove the fuzzy DeMorgan law. i. A ∩ AC = (AC ∪ BC)C ii. A ∪ AC = (AC ∩ BC)C	Creating	9
8	Describe the FA M system architectures	Analyse	9
9	Define defuzziffication	Apply	9
10	Describe the geometry of fuzzy sets.	Apply	8
	UNIT-VI		
1	Explain the Fuzzy synthesis evaluation and Fuzzy ordering.	Apply	10
2	Explain the concept of fuzzification with an example.	Evaluate	10
3	What are the rules based format used to represent the fuzzy information	Creating	10
4	Explain the importance of fuzzi logic control in various fields.	Apply	10
5	Write short notes on fuzzification interface.	Analyse	10
6	Write short notes on Fuzzy neural networks.	Apply	10
7	Discuss in detail the methods to generate membership functions.	Analyse	10
8	Write about aggregation of fuzzy rules.	Analyse	10
9	Explain the Single value decomposition.	Evaluate	10
10	Explain the combs method.	Apply	10
	UNIT-VIII		
1	What are the limitations of specialized on-line learning control architecture?	Analyze	10
2	Write about the Indirect learning architecture.	Understand	10
3	Using the perceptron learning rule, _nd the weights required to perform the following classifications. Vectors (1 1 1 1),(-1 1 -1 -1) and (1 -1 -1 1) are members of class (having val ue -1). Use learning rate of 1 and starting weights of 0. Using each of the training and vectors as input, test the response of the net.	Understand	10
4	Write about the Specialized on-line learning control architecture.	Analyse	10
5	What is fuzzy logic?	Understand	10
6	What are the stopping conditions used to stop the progress of the training algorithm	Understand	10
7	Explain the algorithm used for training the perceptron net.	Understand	10
8	What is a fuzzy logic controller? Explain the different types of FLCS.	Evaluate	10
9	Define the problem of control system design	Understand	10
10	State the major implicit assumptions in a fuzzy control systems design.	Understand	10

GROUP-I I (LONG ANSWER TYPE QUESTIONS)

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOME
	UNIT-I		
1	a. Draw and explain the Physical structure of human brain	Understand	1

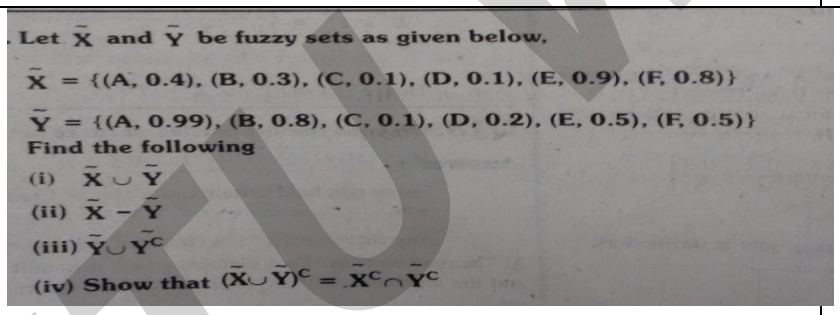
	b. Compare and contrast the difference between biological neuron network		
2	a. Illustrate biological neuron. Compare this with the artificial neuron modal b. What are the applications of neural network.	Understand	1
3	a. Discuss briefly about Hodgkin-Huxley neuron model? b. Discuss in detail about the Spiking neuron model.	Understand	1
4	Explain briefly the McCulloch-Pits neuron model What are the three models of artificial neuron? Explain them in detail.	Analyse	1
5	Explain the structure and working of neuron with neat diagram.	Understand	1
6	Define neuron and discuss about the three basic elements of neuron modal.	Understand	1
7	Write the characteristics of Artificial Neural Network.	Understand	2
8	Discuss different models of Neuron.	Evaluate	2
9	What are the various active building blocks of neural networks? Explain the current mirror and inverter based neuron in detail.	Understand	2
10	Explain the role of neural networks in Power System Planning.	Understand	2
	UNIT-II		
1	What are the three basic elements of a neuronal model?	Understand	3,4
2	Discuss various artificial neural network architectures/	Understand	3,4
3	Define an activation function. What are the various types of neuron activation function?	Understand	3
4	Distinguish between single layer and multilayer feed forward networks.	Analyse	3
5	Compare and contrast supervised and unsupervised learning strategies.	Understand	4
6	Describe the Hebbian learning rule	Understand	3
7	Describe Delta learning rule with an example	Understand	3,4
8	Describe Window-Hoff learning rule and its limitations.	Evaluate	3
9	State and prove the perceptron convergence theorem.	Understand	4
10	(a) Describe the geometry of fuzzy sets. (b) Describe theFA M system architectures.	Understand	3,4
	UNIT-III		
1	What is XOR problem? Draw and explain the architectural graph of network for solving the XOR problem.	Analyze	5
2	Explain with an example, the role of discriminate function in classification of neural networks.	Understand	5
3	Write single discrete perception training algorithm (SDPTA).	Understand	5
4	What are advantage and disadvantages of perceptron model	Analyse	5
5	State and prove perceptron convergence theorem.	Understand	5
6	Give a brief account on multi category single layer perceptron network.	Understand	5
7	Illustrate a three-class classifier which uses three discrete perceptron.	Understand	5
8	Class prototype vectors areX1 = [−2] , X 2 = − 23 , X 3 = [3] : Class 1 X 4 = [1] , X 5 = [2] , : Class 2 (a) Design the dichotomizer using a single discrete perceptron and non-linear dis - criminant function of quadratic type. (b) Draw separating lines in the augmented weight space for each pattern. (c) Draw patterns in augmented pattern space.	Understand	5
9	Write single discrete perceptron training algorithm (SDPTA)	Understand	5
10	(a) Differentiate single layer and multilayer networks. (b) Generate the output of OR, NOT function using McCulloch-Pitts Neuron	Understand	5
	UNIT-1V		
1	What is credit assignment problem? Explain.	Analyze	6
2	Discuss briefly about the generalized delta rule.	Understand	6
3	State and prove Kolmogorov's theorem	Understand	6
4	. (a) How is the error back propagated in BPN ? (b) Differentiate between local minima and global minima ?	Analyse	6

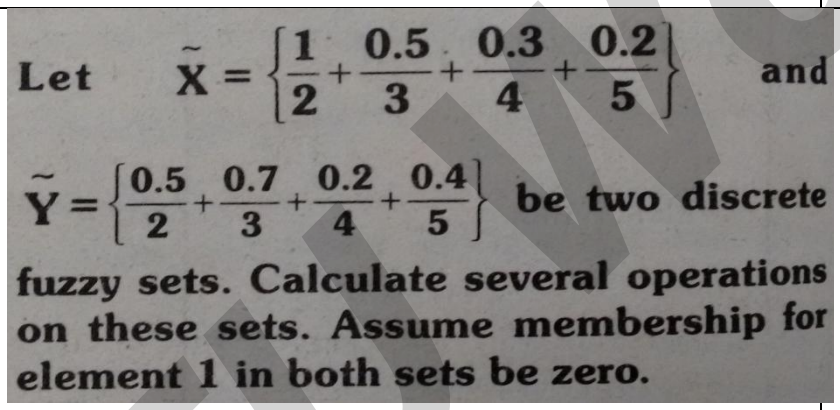
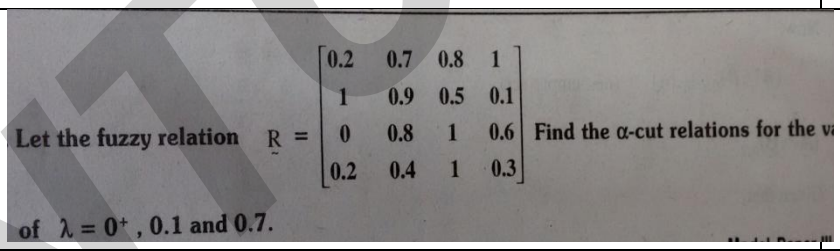
5	What are the steps involved in back propagation algorithm? Explain.	Evaluate	6
6	What is the significant of momentum term in back propagation learning?	Understand	6
7	What is back propagation? Derive its learning algorithm with a schematic two layer feed forward neural network?	Understand	6
8	With suitable diagram, derive the weight update equations in back propagation algorithm for a multilayer feed forward neural network and explain the effect of learning rate and momentum terms in weight update equations.	Understand	6
9	Using your own intuition and your own definitions of the universe of discourse, plot fuzzy membership functions for the following variables : Age of people (a) Very Young. (b) Young. (c) Middle –aged (d) Old (e) Very old.	Understand	6
10	(a) What is meant by uncertainty? What are various types of uncertainties? Explain the measures of uncertainty. (b) Describe the measures of Fuzziness and dissonance.	Understand	6
	UNIT-V		
1	With the help of linear association network diagram. Explain the input output mapping.	Analyze	7
2	What is Hebbian learning? Explain its role in linear associative	Evaluate	7
3	With a neat diagram explain discrete-time bidirectional associative memory. Also explain encoding and decoding of information in BAM.	Evaluate	7
4	What is the Hopfield network? Explain.	Analyse	7
5	Explain in detail about discrete Hopfield network.	Understand	7
6	Explain the stability analysis of discrete and continous version of the Hopfield models.	Understand	7
7	Discuss in detail memory-based learning algorithms.	Understand	7
8	List the applications of instance-based and memory-based learning algorithms.	Understand	7
9	Suggest and explain activation model, learning method for solving non-linear activation problems.	Understand	7
10	(a) Discuss memory based learning in detail. (b) How is boundary region determined using linear seperability concept	Understand	7
	UNIT-VI		
1	Explain operations and properties of crisp relations.	Analyze	8
2	Describe the geometry of fuzzy sets.	Understand	8
3	Compare and constrast classical set theory and fuzzy set theory.	Understand	8,9
4	What is meant by uncertainty? What are various types of uncertainties? Explain the measures of uncertainty.	Analyse	8,9
5	Discuss the trapezoidal membership function.	Evaluate	9
6	(a) What is XOR problem? Draw and explain the architectural graph of network for solving the XOR problem. (b) Discuss about output representation and decision rule.	Evaluate	8,9
7	. Determine the weights of a network with 4 input and 2 output units using delta learning law with f(a) = 1 1 + e − a for the following input-output pairs: Input : [1 1 0 0] T [1 0 0 1] T [0 0 1 1] T [0 1 1 0] T Output : [1 1] T [1 0] T [0 1] T [0 0] T .	Evaluate	8,9
8	. Consider the fuzzy sets & defined on the interval X=[0,5] of real numbers,by the membership grade functions. μ(x) = XX+1 , μ B˜ (x) = 2−x Determine the mathematical formulae and graphs of the membership grade func - tions of each of the following sets. (a) A c , B c . (b) A ∩ B. (c) A ∪ B . (d) (A ∪ B) c .	Evaluate	8,9
9	Let H = High, VH = very high, S˜ = slow and Q˜ (Quite slow) indicate, the associated fuzzy sets as follows. For X={30,40,50,60,70,80,90,100}, the set of temperatures and Y={10,20,30,40,50,60}, the set of rotations per minute.	Understand	9

	H˜ = {(70, 1) (80, 1) (90, 0.3) } V˜ H = {(90, 0.9) (100, 1)} Q˜ S = {(10, 1) (20, 0.8)} S˜ = {(30, 0.8) (40, 1) (50, 0.6)} Apply the fuzzy Modus ponens rule to deduce Rotation is quite slow given. i. If the temperature is high then rotation is slow. **ii.** ii. The temperature is very high.		
10	(a) Describe the geometry of fuzzy sets. (b) Describe the FAM system architectures.	Understand	9
	UNIT-VII		
1		Analyze	10
2	(a) Construct a Hopfield network to associate 3x3 input images with dots and dashes. (b) How many spurious attractors does this network have i.e how many patterns other than dots and dashes are stable attractors? (c) How many input errors can this network withstand i.e how much can the image of a dot (or dash) be corrupted while still allowing the network to retrieve a dot (or dash)?	Understand	10
3	Write note on the following. (a) Bidirectional Associate memories. (b) Grossberg layer.	Understand	10
4	Define defuzzification. Explain different methods of defuzzification	Analyse	10
5	(a) What are the rules based format used to represent the fuzzy information. (b) Explain the importance of fuzzi logic control in various fields.	Understand	10
6	Define defuzzification. Explain different methods for defuzzification. Discuss fault diagnosis using ANN.	Understand	10
7	Compare and contrast fuzzy logic control and classical control systems. Explain the application of neural network in load forecasting.	Understand	10
8	Write briefly about c-means clustering	Understand	10
9	Let X = f {a,b,c,d } Y = f {1,2,3,4} and ~ A = f {(a,0)(b,0.8)(c,0.6)(d,1)} ~ B = f {(1,0.2)(2,1)(3,0.8)(4,0)} ~ C = f {(1,0)(2,0.4)(3,1)(4,0.8)} Determine the implication relations. B IF x is Ã THEN y is $\tilde{B}$. IF x is Ã THEN y is $\tilde{B}$ ELSE y is $\tilde{C}$	Understand	10
10	Class prototype vectors are X1 = [-2] ; X2 =$[\frac{-2}{3}]$; X3 = [3] : Class1 X4 = [1] ; X5 = [2] ; Class2: (a) Design the dichotomizer using a single discrete perceptron and non-linear discriminant function of quadratic type. (b) Draw separating lines in the augmented weight space for each pattern. (c) Draw patterns in augmented pattern space.	Understand	10
	UNIT-VIII		
1	Discuss the operation of single neuron system. A neuron j receives inputs from four other neurons whose activity levels are 10, -20, 4 and -2. The respective synaptic weights of the neuron j are 0.8, 0.2, -1.0, and -0.9. Calculate the output of neuron for the following two situations (a) The neuron is linear. (b) The neuron is represented by a McCulloch-Pitts model. Assume that the bias applied to the neuron is zero.	Understand	10
2		Evaluate	10

3	Explain how neurocomputing circuits can be modeled using digital and analog circuits.	Evaluate	10
4	Explain the algorithm used for training the perceptron net.	Analyse	10
5	a. Explain the step-by-step procedure in designing of a fuzzy logic controller. b. Write briefly about c-means clustering.	Understand	10
6	State the major implicit assumptions in a fuzzy control system design.	Understand	10
7	Draw a block diagram of a possible fuzzy logic control systems. Explain about each block.	Understand	10
8	Explain fault diagnosis using ANN.	Understand	10
9	Write briefly c-means clustering.	Understand	10
10	Write note on the following. (a) Bidirectional Associate memories. (b) Grossberg layer	Understand	10

GROUP-III (PROBLEMS)

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	PROGRAM OUTCOME
	UNIT-VI		
1	Given that A = $\frac{0.2}{3} + \frac{0.5}{4} + \frac{0.8}{5}$ and B = $\frac{0.8}{5} + \frac{0.2}{8}$. Determine the cartesian product of two sets A*B.	Understand	1
2		Evaluate	2
3	Given that A=0.2/3 + 0.5/4 + 0.8/5 and B=0.8/5 + 0.2/8, determine the Cartesian product of the two sets; A x B. R2 | Z1 | Z2 | Z3 Y1 | 1 | 0 | 1 y2 | 0 | 0.5 | 0.4 y3 | 0.7 | 0.9 | 0.6 y4 | 0 | 0 | 0 R1 | Y1 | Y2 | Y3 | Y4 X1 | 0.3 | 0 | 0.7 | 0.3 X2 | 0 | 1 | 0.2 | 0	Evaluate	2

4	Investigate the use of back-propagation learning using a sigmoidal nonlinearity to achieve one-to-one mapping as given below: f(x) = 1/x, 1 _ x _ 100. Compute the following: (a) Set up two sets of data, one for network training and other for testing. (b) Use the training data set to compute the synaptic weights of the network, assumed to have a single hidden layer.	Analyse	2
5	For the data shown in the following data table show the first iteration in trying to compute the membership values for the input variables p and Q into the regions A, B, & C. P Q A B C 0.6 0.7 8 1 0 0 (a) Use 2 x 2 x 3 network with initial random weights (b) Use sigmoid activation function Calculate the membership value for the following input data using the above calculated weights. P Q 0.12 0.3.	Evaluate	2
6		Evaluate	1
7		Evaluate	1
8	Let H = High, VH = very high,.$\tilde{S}$= slow and .$\tilde{Q}$ (Quite slow) indicate, the associated fuzzy sets as follows. For X=f30,40,50,60,70,80,90,100g, the set of temperatures and Y=f10,20,30,40,50,60g, the set of rotations per minute. .$\tilde{H}$= f(70, 1) (80, 1) (90, 0.3) g $\tilde{V}$ H = f(90, 0.9) (100, 1)g $\tilde{Q}$ S = f(10, 1) (20, 0.8)g .$\tilde{s}$= f(30, 0.8) (40, 1) (50, 0.6)g Apply the fuzzy Modus ponens rule to deduce Rotation is quite slow given. i. If the temperature is high then rotation is slow. ii. The temperature is very high.	Evaluate	1

9	Let $\tilde{X} = \{ \frac{1}{2} + \frac{0.5}{3} + \frac{0.3}{4} + \frac{0.2}{5} \}$ and $\tilde{Y} = \{ \frac{0.5}{2} + \frac{0.7}{3} + \frac{0.2}{4} + \frac{0.4}{5} \}$ be two discrete fuzzy sets. Calculate several operations on these sets. Assume membership for element 1 in both sets be zero.	Understand	1
10	Let $A = \{a_1, a_2, a_3\}$ $B = \{b_1, b_2\}$ $C = \{c_1, c_2, c_3\}$ be three sets. Let $\tilde{R}_1$ be a relation on $A \times B$ and $\tilde{R}_2$ be a relation on $B \times C$ defined as given below. $\tilde{R}_1$: a_1 (0.5, 0.1), a_2 (0.2, 0.9), a_3 (0.8, 0.6) over b_1, b_2 $\tilde{R}_2$: b_1 (0.6, 0.4, 0.7), b_2 (0.5, 0.8, 0.9) over c_1, c_2, c_3 Obtain the Max-Min composition for these relations.	Understand	1