NEURAL NETWORKS AND FUZZY LOGIC

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF Electrical and Electronics Engineering

(Name of the Subject / Lab Course) : <u>NEURAL NETWORKS AND FUZZY LOGIC</u>

JNTU CODE – A80238 **Programme : UG**

Branch: Electrical and Electronics Engineering	**Version No : 01**
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Distribution List :

Prepared by : 1) Name : G.Srikanth	**1) Name :**
2) Sign :	**2) Sign :**
3) Design : Assoc Prof	**3) Design :**
4) Date :	**4) Date :**

Verified by : 1) Name :	*** <u>For Q.C Only.</u>**
2) Sign :	**1) Name :**
3) Design :	**2) Sign :**
4) Date :	**3) Design :**
	4) Date :

Approved by : (HOD) 1) Name :Dr.S.Radhika

2) Sign :

3) Date :

2.SYLLABUS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

HYDERABAD

IV Year B.Tech EEE I-Sem	**T**	**P**	**C**
	4+1*	**0**	**4**

NEURAL NETWORKS AND FUZZY LOGIC

Unit – I: Introduction to Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

Unit- II: Essentials of Artificial Neural Networks

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

Unit–III: Single Layer Feed Forward Neural Networks

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

Unit- IV: Multilayer Feed forward Neural Networks

Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

Unit V: Associative Memories

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem

Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network

Summary and Discussion of Instance/Memory Based Learning Algorithms, Applications.

Unit – VI: Classical & Fuzzy Sets

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT VII: Fuzzy Logic System Components

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT VIII: Applications

Neural network applications: Process identification, control, fault diagnosis and load forecasting.

Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

TEXT BOOK:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 - S.N.Sivanandam, S.Sumathi, S.N.Deepa, TMH, 2006

ADDITIONAL TOPICS

1. A HIGH PERFORMANCE INDUCTION MOTOR DRIVE SYSTEM USING FUZZY LOGIC CONTROLLER
2. SPEED CONTROL OF AN INDUCTION MOTOR USING THE FUZZY LOGIC .

REFERENCE BOOKS:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks – Simon Hakins , Pearson Education
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

Websites

1. *ieeexplore.ieee.org*
2. www.sciencedirect.com/
3. *www.academia.edu*

1. Vision of the Department

To provide excellent Electrical and electronics education by building strong teaching and research environment

4. Mission of the Department

1. To offer high quality graduate program in Electrical and Electronics education and to prepare students for professional career or higher studies.
2. The department promotes excellence in teaching, research, collaborative activities and positive contributions to society

4.Programme Educational Objectives(EEE)

PEO 1. Graduates will excel in professional career and/or higher education by acquiring knowledge in Mathematics, Science, Engineering principles and Computational skills.

PEO 2. Graduates will analyze real life problems, design Electrical systems appropriate to the requirement that are technically sound, economically feasible and socially acceptable.

PEO 3.Graduates will exhibit professionalism, ethical attitude, communication skills, team work in their profession, adapt to current trends by engaging in lifelong learning and participate in Research & Development.

4.Programme Outcomes (EEE)

PO 1. An ability to apply the knowledge of Mathematics, Science and Engineering in Electrical and Electronics Engineering.

PO 2. An ability to design and conduct experiments pertaining to Electrical and Electronics Engineering.

PO 3. An ability to function in multidisciplinary teams

PO 4. An ability to simulate and determine the parameters such as nominal voltage current, power and associated attributes.

PO 5. An ability to identify, formulate and solve problems in the areas of Electrical and Electronics Engineering.

PO 6. An ability to use appropriate network theorems to solve electrical engineering problems.

PO 7. An ability to communicate effectively.

PO 8. An ability to visualize the impact of electrical engineering solutions in global, economic and societal context.

PO 9. Recognition of the need and an ability to engage in life-long learning.

PO 10 An ability to understand contemporary issues related to alternate energy sources.

PO 11 An ability to use the techniques, skills and modern engineering tools necessary for Electrical Engineering Practice.

PO 12 An ability to simulate and determine the parameters like voltage profile and current ratings of transmission lines in Power Systems.

PO 13 An ability to understand and determine the performance of electrical machines namely speed, torque, efficiency etc.

PO 14 An ability to apply electrical engineering and management principles to Power Projects.

6. Course objectives and outcomes

Course objectives:

1. This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.

2. It deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components.

3. The Neural Network and Fuzzy Network system application to Electrical Engineering is also presented. This subject is very important and useful for doing Project Work.

4. The main objective of this course is to provide the student with the basic understanding of neural networks and fuzzy logic fundamentals.

Course outcomes:

upon completing this course, the student should have: -

1. Knowledge and understanding: Understanding principles of neural networks and fuzzy

Logic fundamentals.

2. Design the required and related systems

3. After going through this course student will get thorough knowledge in biological neuron and artificial neurons.

4. Students will be able to compare analysis between human and computer, Artificial Neural Networks models, characteristics of ANN's learning strategies, learning rules and basics of fuzzy logic.

5. Students will be able to understand concept of classical and fuzzy sets, fuzzification and defuzzification, with which they can be able to apply the conceptual things to the real world electrical and electronics problems and applications.

7. Importance of the course

The world we live relies more on electronic gadgets and computers to control the behaviour of real world resources .Example...Commerce is performed without using a single bank note exchanged.Aeroplanes land and take off without even looking out of a window.Coordination process can be automated using computers ,this is where Neural networks come in. Neural networks are important for their ability to adapt.They have a unique way of storing and retreiving information,wherein the information is distributed.The nets are capable of making memory associations with the help of which large amount of data can be handled efficiently and fastly.They are also fault tolarent i..e, even if a few neurons fail it will not disable the entire system.The paradigm of neural networks, developed to emulate some of the capabilities of the human brain as demonstrated great potential for salient features such as learning ,fault tolerance and generalisation . This subject is very important and useful for doing Project Work

This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks. Also deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components. The Neural Network and Fuzzy Network system application to Electrical Engineering is also presented. This subject is very important and useful for doing Project Work.

8. Prerequisites

Linear algebra, advanced calculus, discrete mathematics, Boolean algebra or equivalent.

9.Instructional Learning Outcomes

Unit-1: **Introduction to Neural Networks**

- Students will be able to understand Organization of the Brain.
- Students will be able to understand Biological and Artificial Neuron Models.
- Students will be able to understand Characteristics of ANN.
- Students will be able to understand Applications of ANN.

Unit- II:Essentials of Artificial Neural Networks

- Students will be able to understand Operations of Artificial Neuron.
- Students will be able to understand Types of Neuron Activation Function.
- Students will be able to understand ANN Architectures.

- Students will be able to understand Learning Strategies and learning rules.

Unit–III: Single Layer Feed Forward Neural Networks

- Students will be able to understand Perceptron Models.
- Students will be able to understand Perceptron Networks and Perceptron Convergence theorem.
- Students will be able to understand Training Algorithms

Unit- IV: Multilayer Feed forward Neural Networks

- Students will be able to understand Generalized Delta Rule
- Students will be able to understand Derivation of Backpropagation (BP) Training.
- Students will be able to understand Summary of Backpropagation Algorithm.
- Students will be able to understand Kolmogorov Theorem, Learning Difficulties and Improvements

Unit V: Associative Memories

- Students will be able to understand Hebbian Learning
- Students will be able to understand Bidirectional Associative Memory (BAM) Architecture.
- Students will be able to understand BAM Energy Function, Proof of BAM Stability Theorem.
- Students will be able to understand Architecture of Hopfield Network.

Unit – VI: Classical & Fuzzy Sets

- Students will be able to understand properties, Operations and relations; Fuzzy sets
- Students will be able to understand Operations, properties, fuzzy relations.

UNIT VII: Fuzzy Logic System Components

- Students will be able to understand Fuzzification.
- Students will be able to understand Defuzzification to crisp sets.
- Students will be able to understand Defuzzification methods.

UNIT VIII: Applications

- Students will be able to understand **Neural network applications.**
- Students will be able to understand **Fuzzy logic applications.**

1. COURSE MAPPING WITH PEOS AND POS

PO'S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	

Mapping of Course with Programme Educational Objectives

S.No	Course component	code	course	Semester	PEO 1	PEO 2	PEO 3
1	Professional Core		NNFL	II		√	√

Mapping of Course outcomes with Programme outcomes:

*When the course outcome weightage is < 40%, it will be given as moderately correlated (1)

*When the course outcome weightage is >40%, it will be given as strongly correlated (2)

EHV AC															
CO1: Students learn about the principles of neural networks and fuzzy Logic fundamentals.	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	
CO2: Student can design the required and related systems	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	
CO:3 . Students can get thorough knowledge in biological neuron and artificial neurons.	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	
CO:4 Students will understand and compare analysis between human and computer	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	
CO:5 Students understand concept of classical and fuzzy sets, fuzzification and defuzzification, with which they can be able to apply the conceptual things to the real world electrical and electronics problems and applications.	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	

11.Individual Time Table

Individual Faculty Work Load								
Faculty Name: Mr.G.SRIKANTH						Acad Year 2014-15,	WEF: (30-06-2014	
Time	09.30-10.20	10.20-11.10	11.10-12.00	12.00-12.50	12.50-13.30	13.30-14.20	14.20-15.10	15.10-16.00
Period	1	2	3	4		5	6	7
Monday				EM-III	LUNCH			EM-I
Tuesday	EM-III	EE LAB-MECH-IIB1						
Wednesday		EM-I		EM-III		EM-II LAB-EEE-III B1		
Thursday	EM-I					EM-II LAB-EEE-III B2		
Friday		EM-I		EM-III		EE LAB-MECH-IIB2		
Saturday	EM-III		EM-I					
No	Subject(T/P)			Periods Per Week				
1	EM-III			5				
2	EM-I			5				
3	EM-II LAB			6				
	EE LAB			6				

CLASS TIME TABLE

Geethanjali College of Engineering & Technology **Department of Electrical & Electronics Engineering**		
Year/Sem/Sec: IV-B.Tech-II Semester(Version-1)	**Room No: LH-14**	**Acad Year: 2014-15, WEF: 29-12-2014**
CLASS TEACHER: N.V.BHARADWAJ		

Time	09.30-10.20	10.20-11.10	11.10-12.00	12.00-12.50	12.50-13.30	13.30-14.20	14.20-15.10	15.10-16.00
Period	**1**	**2**	**3**	**4**		**5**	**6**	**7**
Tuesday	TECH SEMINAR	TECH SEMINAR	TECH SEMINAR	TECH SEMINAR	LUNCH	PROJECT REVIEW	PROJECT REVIEW	PROJECT REVIEW
Wednesday	PROJECT REVIEW	PROJECT REVIEW	PROJECT REVIEW	PROJECT REVIEW		PROJECT REVIEW	PROJECT REVIEW	PROJECT REVIEW
Thursday	PROJECT REVIEW	PROJECT REVIEW	PROJECT REVIEW	PROJECT REVIEW		TECH SEMINAR	TECH SEMINAR	LIB/SPORTS
Friday	HVDC	HVDC	EHV AC	EHV AC		NNFL	NNFL	EHV AC
Saturday	EHV AC	NNFL	HVDC	HVDC		EHV AC	NNFL	HVDC

No	Subject(T/P)	Faculty Name	Mobile Number	Periods/Week
1	HV DC	N. SHANTHINATH		4+1*-Periods
2	EHV AC	AZRA ZAINEB		4+1*-Periods
3	NNFL	G. SRIKANTH		4+1*-Periods

13.1LECTURE SCHEDULE

Sl. No	Unit No	Total Periods	Topic	Reg/Additional	LCD/OHP/BB	Remark
1	1	6	Introduction to Neural Networks Introduction, Humans and Computers,		LCD/OHP/BB	
			Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models,		LCD/OHP/BB	
			Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model,		LCD/OHP/BB	
			Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model,		LCD/OHP/BB	
			Historical Developments, Potential Applications of ANN.		LCD/OHP/BB	
2	2	5	*Essentials of Artificial Neural Networks* Artificial Neuron Model,		LCD/OHP/BB	
			Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures,		LCD/OHP/BB	
			Classification Taxonomy of ANN – Connectivity,		LCD/OHP/BB	
			Neural Dynamics (Activation and Synaptic),		LCD/OHP/BB	
			Learning Strategy (Supervised, Unsupervised, Reinforcement),		LCD/OHP/BB	
			Learning Rules, Types of Application		LCD/OHP/BB	

3	3	4	*Single Layer Feed Forward Neural Networks* Introduction, Perceptron Models: Discrete, Continuous and Multi-Category,		LCD/OHP/BB	
			Training Algorithms: Discrete and Continuous Perceptron Networks,		LCD/OHP/BB	
			Perceptron Convergence theorem,		LCD/OHP/BB	
			Limitations of the Perceptron Model, Applications.		LCD/OHP/BB	
4	4	4	Multilayer Feed forward Neural Networks		LCD/OHP/BB	
			Credit Assignment Problem, Generalized Delta Rule,		LCD/OHP/BB	
			Derivation of Backpropagation (BP) Training,		LCD/OHP/BB	
			Summary of Backpropagation Algorithm,		LCD/OHP/BB	
			Kolmogorov Theorem,		LCD/OHP/BB	
			Learning Difficulties and Improvements.		LCD/OHP/BB	
5	5	6	**Associative Memories** **Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning,**		LCD/OHP/BB	
			General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance,		LCD/OHP/BB	
			The Linear Associator, Matrix Memories, Content Addressable Memory),		LCD/OHP/BB	
			Bidirectional Associative Memory (BAM) Architecture,		LCD/OHP/BB	

			BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function,		LCD/OH P/BB	
			Proof of BAM Stability Theorem **Architecture of Hopfield Network: Discrete and Continuous versions,**		LCD/OH P/BB	
			Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network		LCD/OH P/BB	
			Summary and Discussion of Instance/Memory Based Learning Algorithms,		LCD/OH P/BB	
			Applications.		LCD/OH P/BB	
6	**6**	**6**	**Classical & Fuzzy Sets** **Introduction to classical sets - properties, Operations and relations;**		LCD/OH P/BB	
			Fuzzy sets,		LCD/OH P/BB	
			Membership, Uncertainty,		LCD/OH P/BB	
			Operations, properties,		LCD/OH P/BB	
			fuzzy relations, cardinalities,		LCD/OH P/BB	
			membership functions.		LCD/OH P/BB	
7	**7**	**5**	***Fuzzy Logic System Components*** **Fuzzification,**		LCD/OH P/BB	
			Membership value assignment,		LCD/OH P/BB	

			development of rule base and decision making system,		LCD/OHP/BB	
			Defuzzification to crisp sets,		LCD/OHP/BB	
			Defuzzification methods.		LCD/OHP/BB	
8	8	4	Applications		LCD/OHP/BB	
			Neural network applications: Process identification, control,		LCD/OHP/BB	
			fault diagnosis and load forecasting.		LCD/OHP/BB	
			Fuzzy logic applications: Fuzzy logic control and		LCD/OHP/BB	
			Fuzzy classification.		LCD/OHP/BB	

13.2 MICRO PLAN

Sl. No	Unit No	Date	Topic	Reg/Additional	LCD/OHP/BB	Remark
1	I	2/1/15	**Introduction to Neural Networks** Introduction, Humans and Computers,		LCD/OHP/BB	
2		2/1/15	Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models,		LCD/OHP/BB	
3		2/1/15	Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model,		LCD/OHP/BB LCD/OHP/BB	
4		3/1/15	Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model,		LCD/OHP/BB	

5		3/1/15	**Historical Developments, Potential Applications of ANN.**		**LCD/OHP/B B**	
6		9/1/15	***Essentials of Artificial Neural Networks*** **Artificial Neuron Model,**		**LCD/OHP/B B**	
7	**II**	9/1/15	**Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures,**		**LCD/OHP/B B**	
8		16/1/15	**Classification Taxonomy of ANN – Connectivity,**		**LCD/OHP/B B**	
9		16/1/15	**Neural Dynamics (Activation and Synaptic),**		**LCD/OHP/B B**	
10		16/1/15	**Learning Strategy (Supervised, Unsupervised, Reinforcement),**		**LCD/OHP/B B**	
11		23/1/15	**Learning Rules, Types of Application**		**LCD/OHP/B B**	
12	**III**	23/1/15	***Single Layer Feed Forward Neural Networks*** **Introduction, Perceptron Models: Discrete, Continuous and Multi-Category,**		**LCD/OHP/B B**	
13		23/1/15	**Training Algorithms: Discrete and Continuous Perceptron Networks,**		**LCD/OHP/B B**	
14		24/1/15	**Perceptron Convergence theorem,**		**LCD/OHP/B B**	
15		24/1/15	**Limitations of the Perceptron Model, Applications.**		**LCD/OHP/B B**	
16	**IV**	30/1/15	**Multilayer Feed forward Neural Networks**		**LCD/OHP/B B**	
17		30/1/15	**Credit Assignment Problem, Generalized Delta Rule,**		**LCD/OHP/B B**	
18		30/1/15	**Derivation of Backpropagation (BP) Training,**		**LCD/OHP/B B**	
19		31/1/15	**Summary of Backpropagation Algorithm,**		**LCD/OHP/B B**	

20	**V**	31/1/15	**Kolmogorov Theorem,**		**LCD/OHP/B B**	
21		6/2/15	**Learning Difficulties and Improvements.**		**LCD/OHP/B B**	
22		6/2/15	**Associative Memories** **Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning,**		**LCD/OHP/B B**	
23		6/2/15	**General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance,**		**LCD/OHP/B B**	
24		7/2/15	**The Linear Associator, Matrix Memories, Content Addressable Memory),**		**LCD/OHP/B B**	
25		7/2/15	**Bidirectional Associative Memory (BAM) Architecture,**		**LCD/OHP/B B**	
26	**VI**	20/2/15	**BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function,**		**LCD/OHP/B B**	
27		20/2/15	**Proof of BAM Stability Theorem** **Architecture of Hopfield Network: Discrete and Continuous versions,**		**LCD/OHP/B B**	
28		20/2/15	**Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network**		**LCD/OHP/B B**	
29		6/3/15	**Summary and Discussion of Instance/Memory Based Learning Algorithms,**		**LCD/OHP/B B**	
30		6/3/15	**Applications.**			
		6/315	**Classical & Fuzzy Sets** **Introduction to classical sets - properties, Operations and relations;**		**LCD/OHP/B B**	
31		7/3/15	**Fuzzy sets, Membership, Uncertainty,**			

32		7/3/15	**Operations, properties, fuzzy relations, cardinalities,**		**LCD/OHP/B B**	
33		20/3/15	**membership functions.**			
34	**VII**	20/3/15	***Fuzzy Logic System Components*** **Fuzzification,**		**LCD/OHP/B B**	
35		20/3/15	**Membership value assignment,**			
36		21/3/15	**development of rule base and decision making system,**		**LCD/OHP/B B**	
37		21/3/15	**Defuzzification to crisp sets,**			
38	**VIII**	27/3/15	**Applications**		**LCD/OHP/B B**	
39		27/3/15	**Neural network applications: Process identification, control,**		**LCD/OHP/B B**	
40		27/3/15	**Fuzzy logic applications: Fuzzy logic control and**		**LCD/OHP/B B**	
		28/3/15	**Fuzzy classification.**			
41		28/3/15	**Tutorials(Unit I)**			
42		3/4/15	**Tutorials(Unit II)**			
43		3/4/15	**Tutorials(Unit III)**			
44		3/4/15	**Tutorials(Unit IV)**			

45		4/4/15	**Tutorials(Unit V)**			
46		4/4/15	**Tutorials(Unit VI)**			
47		10/4/15	**Tutorials(Unit VII)**			
48		10/4/15	**Tutorials(Unit VIII)**			
49		10/4/15	**Additional Topic – 1**			
50		17/4/15	**Additional Topic – 2**			
51		17/4/15	**Additional Topic – 3**			
52		17/4/15	**Additional Topic – 4**			
53		18/4/15	**Assignment - 1**			
54		18/4/15	**Assignment – 2**			
55			**Assignment – 3**			
56			**Assignment - 4**			
57			**Mid Test Revision**			
58			**Mid Test Revision**			
59			**Previous Final Exam Paper Discussion**			
60			**Previous Final Exam Paper Discussion**			
61			**Previous Final Exam Paper Discussion**			
62			**Previous Final Exam Paper Discussion**			

14.Detailed Notes

See the attached folder

16. University Question papers of previous years

1. Explain the role of neural networks in Power System Planning. [16]

2. State and prove the perceptron convergence theorem. [16]

3. (a) Differentiate single layer and multilayer networks.
   (b) Generate the output of OR, NOT function using McCulloch-Pitts Neuron. [8+8]

4. (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. [8+8]

5. (a) Discuss memory based learning in detail.
   (b) How is boundary region determined using linear seperability concept. [8+8]

6. Determine the weights of a network with 4 input and 2 output units using delta learning law with f(a) $=\frac{1}{1+e^{-a}}$ 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 : $[1\ 1]^T$ $[1\ 0]^T$ $[0\ 1]^T$ $[0\ 0]^T$. [16]

7. (a) Using Predicate logic solve the following:
   All men are mortal
   Confucius is a man
   Prove : Confucius is mortal
   (b) Let X = {a,b,c,d} Y = {1,2,3,4}
   and $\tilde{A}$ = {(a,0)(b,0.8)(c,0.6)(d,1)}
   $\tilde{B}$ = {(1,0.2)(2,1)(3,0.8)(4,0)}
   $\tilde{C}$ = {(1,0)(2,0.4)(3,1)(4,0.8)}
   Determine the implication relations

   IF x is $\tilde{A}$ THEN y is $\tilde{B}$.
   IF x is $\tilde{A}$ THEN y is $\tilde{B}$ ELSE y is $\tilde{C}$. [16]

8. Write note on the following.
   (a) Bidirectional Associate memories.
   (b) Grossberg layer. [8+8]

⋆⋆⋆⋆⋆

1. Define defuzzification. Explain different methods of defuzzification. [16]

2. (a) Describe the geometry of fuzzy sets.
   (b) Describe the FAM system architectures. [8+8]

3. (a) Using MC-Culloch pitts model implement the following logic functions.
      i. Ex-OR gate.
      ii. Ex-NOR gate.
      iii. AND gate.
      iv. NAND gate.
   (b) Explain the organization of the brain in detail. [16]

4. (a) Define "sensor" connected with fuzzy control system.
   (b) Explain in detail any one application of neuro fuzzy techniques in power systems.

[8+8]

5. Explain how a simple vowel-speech recognition system is implemented using back propagation algorithm. [16]

6. (a) Using suitable diagrams and equations explain the basic Bidirectional Associative
   (b) With suitable diagrams explain the competitive network. [8+8]

7. Class prototype vectors are

$$X_1 = [-2],\ X_2 = \left[-\tfrac{2}{3}\right],\ X_3 = [3] \text{ : Class 1}$$
$$X_4 = [1],\ X_5 = [2],\text{ : Class 2}$$

   (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. [16]

8. Using the perceptron learning rule, find 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 value -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. [16]

1. (a) How is the error back propagated in BPN ?
   (b) Differentiate between local minima and global minima ? [8+8]

2. (a) Prove the fuzzy DeMorgan law.
      i. $A \cap A^C = (A^C \cup B^C)^C$
      ii. $A \cup A^C = (A^C \cap B^C)^C$
   (b) Given an example for the membership function of the fuzzy relation :="considerably smaller than" in RXR. Restrict $\tilde{R}$ to the first ten natural numbers and define the resulting matrix. [8+8]

3. Form a perceptron net for OR function with binary input and output. Compare it with the results using bipolar input and target. [16]

4. Draw a single layer network with continuous perceptions and present the delta learning rule. [16]

5. (a) Explain the following:
      i. Generalized Modus Ponens (GMP).
      ii. Generalized Modus Tollens (GMT).
   (b) Let H = High, VH = very high, $\tilde{S}$ = slow and $\tilde{Q}$ (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.
   $\tilde{H}$ = {(70, 1) (80, 1) (90, 0.3) }
   $\tilde{V}$ H = {(90, 0.9) (100, 1)}
   $\tilde{Q}$ S = {(10, 1) (20, 0.8)}
   $\tilde{S}$ = {(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. The temperature is very high. [16]

6. (a) Draw the Block diagram representation of associative memories and explain why they are needed.
   (b) Prove that in successive iterations, the energy either decreases or remain same but never increases in a discrete Hopfield model. [8+8]

7. (a) “Multi-layer network with linear activation function has same experience power as that of single layer network” elaborate and justify the statement.

   (b) What is the advantage of having hidden layers in an ANN? On what basis is the number of hidden layers and the number of neurons in each hidden layer selected?

[8+8]

8. Explain how neurocomputing circuits can be modeled using digital and analog circuits. [16]

1. State and explain the generalized delta learning rule applied in back propagation algorithm. [16]

2. Write short notes on the following:

   (a) Knowledge base in fuzzy logic control system.

   (b) Decision making logic in fuzzy logic control system. [8+8]

3. (a) With neat diagrams discuss the two self-organized feature maps.

   (b) Explain about learning vector quantization. [8+8]

4. Consider the fuzzy sets & defined on the interval X=[0,5] of real numbers,by the membership grade functions.
   $\mu(\mathrm{x}) = \frac{X}{X+1}$, $\mu\ \tilde{B}\ (\mathrm{x}) = 2^{-x}$
   Determine the mathematical formulae and graphs of the membership grade functions of each of the following sets.

   (a) A^c,B^c.

   (b) A $\cap$ B.

   (c) A $\cup$ B .

   (d) $(A \cup B)^c$. [16]

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. [8+8]

6. With an example explain how a pattern can be trained and classified using discrete perceptron algorithm. [16]

7. (a) How do you justify that brain is a parallel distributed processing system?

   (b) Explain the following terms with respect to Neural networks.

      i. Stability.
      ii. Plasticity.
      iii. Learning.
      iv. Architecture. [8+8]

8. (a) What are the stopping conditions used to stop the progress of the training algorithm.

(b) Explain the algorithm used for training the perceptron net. [8+8]

⋆ ⋆ ⋆ ⋆ ⋆

17. QUESTION BANK

UNIT I
ARCHITECTURES

PART A 2MARKS

1. Define the term ‘axon’.
2. Write about ‘synapse’.
3. Define artificial neural network.
4. Give two examples for the application of ANN.
5. Draw a typical McCulloch-Pitts neuron model.
6. Name two learning rules.
7. Write briefly about supervised learning.
8. Define preceptron.
9. What is meant by multilayer ANN?
10. Define the term “back propagation”.

PART B 16 MARKS

1. Explain briefly the operation of biological neural network with a simple sketch.
2. Discuss supervised learning and unsupervised learning.
3. Describe preceptron learning rule and delta learning rule.
4. Write about Hebbian learning and Widrow-Hoft learning rule.
5. Describe winner-take-all learning rule and outstar learning rule.
6. Describe back propagation and features of back propagation.
7. Describe McCulloch-Pitts neuron model in detail.
8. Write about performance of back propagation learning.
9. What are the limitations of back propagation learning? Explain in detail.
10. Discuss a few tasks that can be performed by a back propagation network.

UNIT II
NEURAL NETWORKS FOR CONTROL

PART A (2 MARKS)

1. What do you mean by networks?
2. Draw the diagram for boltzman machine.
3. Draw the diagram for hop field networks.
4. What is meant by feedback networks?
5. What do you by transient response?
6. List out any two application of neural networks used for controlling.
7. Explain boltzman machine.
8. List out the uses of hop field networks.
9. Give any two application of boltzman machine.

PART B (16 MARKS)

1. Distinguish between hop field continuous and discrete models.
2. Bring out the salient features of boltzman machine.
3. What is meant by converter propagation? Explain briefly.
4. Explain briefly the back propagation technique.
5. Explain how the ANN can be used for process identification with neat sketch.
6. Discuss the sep by step procedure of back propagation learning algorithm in detail.
7. State the advantages and disadvantages of back propagation.
8. Explain the transient response of continuous time networks.
9. Explain the feedback networks of ANN for controlling process.
10. Explain how ANN can be used for neuro controller for inverted pendulum.

UNIT III
FUZZY SYSTEMS

PART A (2 MARKS)

1. Define probability.
2. Name the three types of ambiguities.
3. Define classical set.
4. What is meant by universe of discourse?
5. With a neat sketch write about non non-conventional fuzzy set.
6. Name the different fuzzy set operations.
7. Define fuzziness.
8. Write De Morgan’s law.
9. Define power set.
10. Define fuzzification.

PART B (16 MARKS)

1. Differentiate fuzzy set from classical set and name the properties of classical (crisp) sets.
2. A = {(1/2) + (0.5/3) + (0.3/4) + (0.2/5)}, (8)
3. B = {(0.5/2) + (0.7/3) + (0.2/4) + (0.4/5)} Calculate the several operation of the fuzzy set. (8)
4. Discuss varies properties and operations on crisp relation. (16)
5. Describe fuzzy relation. (16)
6. Explain the operation of fuzzy sets with a suitable example. (16)
7. Write about conditional fuzzy proposition and unconditional fuzzy proposition. Explain fuzzy
8. associate memory (FAM) with a suitable example. (16)
9. Define defuzzification and explain the different defuzzification methods. (16)
10. Explain fuzzy Cartesian and composition with a suitable example. (16)
11. Explain the concept of fuzzy set with suitable examples. (16)
12. Explain the terms (16)

a. Fuzziness
b. Power set.
c. Union of two sets.
d. Complement of two sets.
e. Difference of two sets.

UNIT IV

FUZZY LOGIC CONTROL

PART A (2 MARKS)

1. Define membership function.
2. Mention the properties of λcut .
3. What is meant by implication?
4. What is the role of membership function in fuzzy logic?
5. Define Lambda-cuts for fuzzy set.
6. Write about classical predicate logic.
7. Define tautologies.
8. List down common tautologies.
9. Define adopticee fuzzy system.
10. What for genetic algorithm is used?

PART B (16 MARKS)

1. Write the components of a fuzzy logic system and explain them. (16)
2. Explain min-max method of implication with a suitable example. (16)
3. Explain monotonic (proportional) reasoning. (16)
4. Who is a knowledge engineer? Write about extracting information from knowledge engineer.(16)

5. Explain the various ways by which membership values can be assigned to fuzzy variables. (16)
6. Discuss the various special features of the membership function. (16)
7. With a neat sketch discuss the major components of fuzzy controller. (16)
8. Write about genetic algorithm and its application. (16)
9. Write the different deterministic form of classical decision-making theories and explain any
10. two. (16)
11. 10)Write short notes on (16)
a. Lambda-cut.
b. Knowledge base.
c. Adopticee fuzzy system.

UNIT V
APPLICATION OF FLC

PART A (2 MARKS)

1. What are the rules based format used to represent the fuzzy information?
2. What is image processing?
3. Define image and pixel.
4. State two assumptions in fuzzy control system design.
5. Name the principal design elements in a general fuzzy logic control system.
6. Draw a schematic diagram of a typical closed-loop fuzzy control situation.
7. Define "sensor" connected with fuzzy control system.
8. Name the two control system.
9. A simple fuzzy logic control system has some features: Name any two.
10. Write two sentences about neuro fuzzy controller.

PART B (16 MARKS)

1. Explain the importance of fuzzi logic control in various fields. (16)
2. Explain the fuzzy logic is being implemented for image processing. (16)
3. Discuss the home heating system with fuzzy logic control. (16)
4. Explain the technique "fuzzy logic blood pressure during anesthesia" in a brief manner. (16)
5. What are the components of fuzzy logic control and explain them in detail with block diagram? (16)
6. What do you mean by neuro fuzzy controller and explain in detail. (16)
7. List out the importance of the neuro fuzzy controller in other fields. (16)
8. Explain in detail any one application of neuro fuzzy techniques in power systems. (16)

18. Assignment Questions

ASSIGNMENT-1

1.Describe the structure & functioning of artificial neural network?

2.Discuss briefly about Hodgkin-Huxley neuron model?

3.Write the historical developments of artificial neural network?

4.Compare & Contrast the difference between biological neuron & artificial neural network?

5.What are the potential applications of neural network?

ASSIGNMENT-2

1.Define an activation function? What are the various types of neuron activation function?

2.Describe Hebbian learning rule in detail?

3.Compare & Contrast the difference between supervised & Unsupervised learning strategies?

4.Describe delta learning rule in detail with an example?

5.Discuss various artificial neural network architectures?

ASSIGNMENT-3

1.Write about single discrete perceptron training algorithm?

2.State & Prove perceptron convergence theorem?

3.What is XOR problem? Draw & explain the architectural graph of network for solving the XOR problem?

4.Write about single continuous perceptron training algorithm?

5.What are the advantages & disadvantages of perceptron model?

ASSIGNMENT-4

1.What is back propagation? Derive its learning algorithm with a schematic two layer feed forward network?

2.State & Prove Kolmogorov's theorem?

3.Explain what are the steps involved in back propagation algorithm?

4.What are the limitations of back propagation algorithm?

5.Explain in detail about Credit Assignment Problem?

<u>ASSIGNMENT-5</u>

1.Explain the working of a Hopfield network with a neat sketch of its architecture?

2.Discuss in detail about memory-based learning algorithm?

3.Explain the stability analysis of discrete & Continuous versions of Hopfield network?

4.Explain in detail about Hetero-Associative memory & Auto-Associative memory?

5.Expalin in detail about instance-based learning algorithms?

ASSIGNMENT-6

1.What is meant by Uncertainity? What are the various types of Uncertainties?

2.Explain in detail about Operations & Properties of Crisp relations?

3.Explain basic operations on fuzzy sets with an examples?

4.Let A & B be two relation matrices defined on the sets {1,3,5} × {1,3,5} where A & B given as A={(x,y)/y=x+2} & B={(x,y)/x<y}. Determine the max-min composition of these relation matrices?

5.Let X={1,2,3,4,5,6,7,8,9,10}. Determine Coordinates & relative Cardinalities of following fuzzy sets?

(i) A={(3,10) (4,0.2) (5,0.3) (6,0.4) (7,0.6) (8,0.8) (10,1) (12,0.8) (14,0.6)}
(ii) B={(2,0.4) (4,0.8) (5,1.0) (7,0.6)}
(iii) C={(2,0.4) (4,1.0) (5,2.0) (7,0.8)}

ASSIGNMENT-7

1.Explain in detail the Concept of fuzzification with an example?

2.Discuss in detail about fuzzy rule base system?

3.Define Defuzzification? Explain different methods for defuzzification?

4.Write short notes on the following terms?

(i) α-cuts of a fuzzy set?

(ii) α-cuts of a fuzzy relation?

5.Let the fuzzy relation R= 0.2 0.7 0.8 1

1 0.9 0.5 0.1

0 0.8 1 0.6

0.2 0.4 1 0.3

Find the α-cut relations for the values of $\lambda=0^+$, 0.1 & 0.7?

ASSIGNMENT-8

1.What is fuzzy logic controller? Explain the different types of fuzzy logic controllers?

2.Define the following terms

(i) Clustering,

(ii) Cluster Analysis,

(iii) Cluster Validity.

3.Write short notes on Classification metric?

4.Explain fault diagnosis using artificial neural network?

5.Explain the applications of neural network in load forecasting?

1. The weight updation in extended delta rule isa.

ΔWi=α (tj-yj)xi f. (y-in j)

b. ΔWij=α (tj-yj) f<SUP.< sup> (y-in j)

c. ΔWij= xi f. (y-in j)

d. ΔWij=α(tj-yj)xi

2. The squared error for particular training pattern if extended delta rule is

a. E=Σ m j=1 (tj-yj)2

b. E=Σ m j=1 (tj+yj)2

c. E=Σ mj=1 (tj)2 d.

E=Σ m j=1 (yj)2

3. The connection matrix W=

a. k=1..a ΣAk Bk

Tb

. k=1..a ΣAk

c. k=1..a ΣBk T

d. k=1..aΣAkBk

4. The Auto associative net training is often called as

a. Storing the vectors

b. Sorting the vectors

c. Recalling the vectors

d. Searching for the vectors

5. Two vectors a and b are orthogonal if

a. Σi ai=0

b. Σi bi=0

c. Σi ai bi=0

d. Σi ai bi =1

6. The following rule allows for anarbitrary differentiable activation function to beapplied to the output units

a. Delta

b. Extended Delta

c. Hebb

d. Hopfield

7. The updation ofthe following is done to reduce the difference between the computed output and the target

a. Input

b. Output

c. Target

d. Weight

8. Representation of data (-1,+1) is called

a. Bipolar

b. Binary

c. Real valued d.

Bilinear

9. The performance of the auto associative memory net is among the following for bipolar vectors than the binary

vectors

a. W orst **b.**

Better c.

Equal

d. No way related

10. Important criterion for anassociative network is among the following it can store

a. Time to train

b. Number of patterns

c. Iterations

d. Zero elements

11. The following rule can beused for both binary as well as bipolar vectors a. Hebb

rule

b. LVQ

c. LMS

d. Winner Rule

12. The weight determination formula in associative memory is

a. W=Σp=1..p ST (p) t(p)

b. W=Σp=1..p S(p) t(p)

c. W=Σp=1..p ST (p)

d. W =Σp=1..p t(p)

13. The following rule changes the weight ofthe connection to minimize the difference between the net

input to the output units and the target value

a. Delta Rule

b. Hebb Rule

c. LMS Rule

d. Adaline

14. The following energy points ofthe Lyapunov surface have to be mapped to desired memory states a. Maximu

b. Minimum

c. Zero

d. Only one

15. The connection matrix W=

a. k=1..a $\Sigma A_k B_k T$

b. k=1..a ΣA_k

c. k=1..a ΣB_k

Td

. k=1..a $\Sigma A_k B_k$

16. The following matrix provides a way to encode associations as memories into a neural network

a. Hebb matrix

b. Covariance matrix

c. Bilinear matrix

d. Inverse matrix

17. The following results if the input vector pair is same as the output vector pair

a. Auto associative

b. Hetero associative

c. Bidirectional Memories

d. Self organizing maps

18. The following results if the input vector pair is different as the output vector pair

a. Auto associative

b. Hetero associative

c. Bidirectional Memories

d. Self organizing maps

19. The following rule for pattern association is aniterative learning rule a. Delta

Rule

b. Hebb Rule

c. LMS Rule

d. Adaline

20. The Delta Rule for single output unit is given by

a. $\Delta Wj=\alpha(t-yin)xi$

b. $\Delta Wj=\alpha(t-yin)$

c. $\Delta Wj= (t-yin)xi$

d. $\Delta Wj=\alpha(yin)xi$

21. When anaxon ofcells excite(s) cell B and repeatedly or persistently takes part in firing it, some growth process ormetabolic change takes place in one or both cells so that A s efficacy as one ofthe cells firing B is

a. Increased

b. Decreased

c. Equal

d. No way related

22. The following is process offorming association between related patterns a. Pattern

Association

b. Pattern Classification

c. Pattern Recognition

d. Pattern Clustering

23. The following nets are single layer nets in which the weights are determined tostore an asset of

pattern association

a. Hopfield

b. Associative Memory

c. Boltzmann's Machine

d. Perceptron

24. The simple and frequently used method for determining the weights for anassociative memory neural net is

a. Hebb rule

b. LVQ

c. LMS

d. Winner Rule

25. The following rule assumes that the error signal is directly measurable a. Delta

Rule

b. Hebb Rule

c. LMS Rule

d. Adaline

26. The Delta Rule for single output unit is given bya.

$\Delta Wj=\alpha(t\text{-}yin)xi$

b. $\Delta Wj=\alpha(t\text{-}yin)$

c. $\Delta Wj= (t\text{-}yin)xi$

d. $\Delta Wj=\alpha(yin)xi$

27. The Delta Rule for several output units is given by

a. $\Delta Wij=\alpha(tj\text{-}yinj)xi$

b. $\Delta W\ ij=\alpha(tjxi$

c. $\Delta W\ ij= (tj\text{-}yinj)xi$

d. $\Delta W\ ij=\alpha xi$

28. Whether the system is auto associative orhetero associative, the following that are to beassociated

is store d in connections ofthe network

a. Input

b. Memory

c. Output

d. Control

29. Following memories can beused as one shot memories

a. OLAM

b. BAM

c. CAM

d. ART

30. The following has the restrictions on the maximum number of associations it can accurately recall

a. ART1

b. BAM

c. ART2

d. Hopfield network

31. The following BAM is implemented byinterconnecting neurons within each layer bymeans ofadditional

weights

a. Continuous

b. Discrete

c. Adaptive

d. Competitive

32. The accretive associative memory is called

a. Auto associative memory

b. Hetero associative memory

c. Hybrid associative memory

d. Hopfield network

33. The following is a system that provides a mapping from a domain ofinputs to a range outputs a.

Fundamental memory

b. Main memory

c. Additional memory

d. Associative memory

34. In associative memory if xk is the input and ykis the output, and when xk ≠ ykthe process is known as

a. Auto associative

b. No associative

c. Heteroassociative

d. Biassociative

35. The following types of BAM are stable a.

Continuous

b. Discrete

c. Adaptive

d. Competitive

36. The following network accepts aninput vector on one set of neurons and produces a related but different

output vector on another set

a. Hopfield

b. BAM

c. Boltzmann's machine

d. ART1

37. All BAM's are unconditionally stable for any weight network was proposed bya. Kosko

b. Rumelhart

c. McCulloh Pitts

d. Kohonen

38. In the following system, any neuron is free to change state at any time a.

synchronous

b. asynchronous

c. linear

d. nonlinear

39. The Bidirectional Associative Memory (BAM) has a neural network oftwo layers connected with the

following system

a. Unidirectional

b. Parallel

c. Feedback

d. Feed forward

40. The BAM is a the following network

a. auto associative

b. Non-associative

c. Heteroassociative

d. ART

41. When ∂E/∂t ≤0 the following is obtained

a. Minima

b. Maxima

c. Focus point

d. Trajectory

42. Energy function ofcontinuous Hopfield net when ı is a time constant is given as a. E =-0.5

i=1..m Σ j=1..mΣ Wij Vi Vj - Σθ i.Vi +(1/ τ) Σ j=1..m fi-1 (v)dv

b. E = -0.25 i=1..m Σ j=1..mΣ Wij Vi Vj - Σθ i.Vi + (1/ τ) Σ j=1m fi-1 (v)dv

c. E = 0.5 i=1..m Σ j=1..mΣ Wij Vi Vj - Σθ i.Vi + (1/ τ) Σ j=1..m fi-1 (v)dv

d. E = 0.5 i=1..m Σ j=1..mΣ Wij Vi Vj - Σθ iVi + Σ j=1..m fi-1 (v)dv

43. In continuous Hopfield the energy function is

a. E =0.5 i=1..m Σ j=1..mΣ Wij Vi Vj +i=1..m Σθ i.Vi

b. E = 0.5 i=1..m Σ j=1..mΣ Wij Vi Vj

c. E = 0.5 i=1..m Σ j=1..m Vi Vj + i=1..m Σθ i.Vi

d. E = 0.5 i=1..m Σ j=1..mΣ Wij j + i=1..m Σ ı i.Vi

44. When the activity ofeach neuron is formed to change with time, the net is found to converge according

to the following differential equation

a. dUi /dt =-Ui/ τ +Σ j=1..m Wij Vj - θ j

b. dUi /dt = -Ui + Σ j=1..mΣ Wij Vj

c. $dU_i /dt = -U_i/ \tau + W_{ij} V_j$

d. $dU_i/dt = \Sigma_{j=1..m} \Sigma W_{ij} V_j - \theta_j$

45. The following matrix has the property $W_{ij} = W_{ji}$ for $i \neq j$ and $W_{ij}=0$ for all i

a. Unit matrix

b. Symmetric matrix

c. Sparse matrix

d. Inverse matrix

46. Continuous valued output functions are used in

a. Discrete Hopfield

b. Continuous Hopfield

c. McCulloh Pitts

d. ART-1

47. The connections between the units are bidirectional in

a. BAM

b. Discrete Hopfield

c. McCulloh Pitts

d. ART-2

48. The Hopfield net can be viewed asan

a. Auto associative BAM

b. Hetero associative BAM

c. Boltzmann's machine

d. McCulloh Pitts model

49. Diagonal elements ofsymmetrical weight matrix of BAM are

a. 1

b. 0

c. Non-zero

d. Negative value only

50. Lack ofthe following connections ensure that the networks are conditionally stable

a. Input

b. Feed forward

c. Feed backward

d. Feed follow

51. In the following network anindividual unit doesn t connect to itself

a. Hopfield

b. BAM

c. Boltzmann's matrix

d. ART1

52.

a.

b.

c.

d.

53. R (i,j) =0 in the relation matrix if (x, y)

a. R

b. Doesn't belongs to R

c. 1

d. Equal

54. Max Min composition T for relation matrix is defined as

a. T (x,z) =y ε Y Max (Min (R (x,y), S(y,z)))

b. T (x,z) = y ε Y Min (Min (R (x,y), S(y,z)))

c. T (x,z) = y ε Y Max (Max (R (x,y), S(y,z)))

d. T (x,z) = y ε Y Min (Max (R (x,y), S(y,z)))

55. If A1={a,b} A2={1,2} A3={α} then =

a.

b.

c.

d.

56. R (i,j) =1 in the relation matrix if (x, y)

a. R

b. Doesn't belongs to R

c. 1

d. Equal

57. If n= 5 the relation R (X1, X2) is termed as

a. Binary

c. Finite

d. Quinary

58. If the universe ofdiscourse orsets are finite, the n-ary relation can beexpressed as an

a. Resource Matrix

b. Relation Matrix c.

Region Matrix

d. Sparse Matrix

59. If R ={(x,y)/y=x+1, (x,y) X then R=

a. {(1,3),(2,3),(3,5)}

b. {(1,2),(2,3),(3,4)} c.

{(1,1),(1,3),(0,4)}

d. {(1,0),(2,0),(3,1)}

60. {(a,b)/a A b B is

a. Ax B

b. A B

c. A∩ B

d. A Bc

61. If A≠ B and Aand B are non empty then

a. A x B = B x A

b. A x B ≠ B x A c.

A x B = θ

d. Ax B = X

62. Composition ofrelation R and S are denoted by

a. R o S

b. S + R

c. R S

d. R - S

63. If Acontains B then

a. Ais superset ofB

b. A is subset of B

c. A is leader of B

d. A is complement of B

64. The following set ofset A is the set ofall possible subsets that are derivable from A including Null set a. Power set

b. Subset

c. Superset

d. Null set

65. If a set has no members then it is called a.

Null set

b. Non empty set

c. Complement set

d. Ideal set

66. Aset with single element is called

a. Hamilton

b. Planar

c. Euler

d. Singleton

67. If Ais fully contained inB then

a. A is superset of B

b. A is subset of B c.

A is leader of B

d. A is complement of B

68. The following set is the which, with reference to a particular context contains all possible elements having the

same characteristics and from which sets can beformed

a. Universe of discourse

b. Complement

c. Singleton set

d. Null set

69. The following is well defined collection ofobjects

a. UML diagrams

b. Sets

c. Venn diagram

d. Figure

70. The following diagram is pictorial representations to denote a set

a. Gannt chart

b. DAG

c. Venn diagram

d. RAG

71. An element is said to beif a belongs to set A

a. Cardinal

b. Member

c. Sibling

d. Child

72. The number ofelements in a set is called

a. Chromatic number

b. Cardinality

c. In degree

d. Out degree

73. The equation ofdefuzzified value x in MOM defuzzification method is

a. x =(xi M Σxi)/

b. x = (xi M-3 Σxi)/

c. x = (xi M+1 Σxi)/

d. x = (xi M Σxi)

74. For a discrete membership function, centre ofarea isa. x

=i=1..n Σxi μ(xi) /(i=1..n Σ μ(xi))

b. x = μ (xi) /(i=1..n Σ μ (xi))

c. x =i=1..n Σxi /(i=1..n Σ ı (xi))

d. x =i=1..n Σxi (xi) /(i=1..n Σ μ (xi))

75. For a discrete membership function, centre ofarea isa. x

=i=1..n Σxi μ(xi) /(i=1..n Σ μ(xi))

b. x = μ (xi) /(i=1..n Σ μ (xi))

c. x =i=1..n Σxi /(i=1..n Σ μ (xi))

d. x =i=1..n Σxi (xi) /(i=1..n Σ μ (xi))

76. In case with more than one element having maximum value firing defuzzification, the following should betaken

a. Mean value of maxima

b. Mean value of minima

c. Centroid

d. Mode value

77. The following is the largest membership grade obtained byany element in that set

a. Index

b. Height

c. Degree

d. Member

78. In MOM defuzzification method in continuous case M could bedefined as the following where |μ(x)

is equal to height offuzzy set

a. M ={ x [-C,C]

b. M = { x&isin [0,1]

c. M = { x&isin [0,0]

d. M = { x&isin [1,1]

79. In centre ofsums method the defuzzified value x is

a. x =i=1..N Σ xi k=1..N . Σμι k xi/ (i=1..N Σ i k=1..N . Σμι k xi)

b. x =i=1..N Σ xi k=1..N . Σμι k xi/ (Σμι k xi)

c. x =i=1..N Σ xi k=1..N . Σμι k xi/ (i=1..N Σ i k=1..N . Σμι k)

d. x* =i=1..N Σxi k=1..N . xi /(i=1..N Σ i k=1..N . Σμι k xi)

80. Acollection ofrules referring to a particular system is known as

a. Fuzzy database

b. Fuzzy rule base c.

Fuzzy set

d. Fuzzy relation

81. Conversion offuzzy set to single crisp value is called

a. Fuzzification

b. Defuzzification

c. Crispification

d. Decryptography

82. Conversion ofsingle crisp value to fuzzy set is called a.

Fuzzification

b. Defuzzification

c. Crispification

d. Decryptography

83. Most commonly used defuzzification method

a. Centre of area

b. Centre ofsums

c. Centre of gravity

d. Mean of maxima

84. Number oftimes overlapping area is counted in centroid method isa. Only

one

b. Twice

c. Thrice

d. Doesn't count at all

85. Number oftimes overlapping area is counted in centre ofsums method is

a. Only one

b. Twice

c. Thrice

d. Doesn't count at all

86. The energy function ofdiscrete Hopfield network is

a. E= -0.5 Σi≠jΣj yiyj wij Σ xi yi+ Σ Oiyj

b. E= Σi≠j Σj yiyj wij Σ xi yi + Σ Oi yj

c. E= -0.25 Σi≠j Σj yiyjwij Σ xi yi + Σ Oi yj

d. $E= -0.5 \sum_{i \neq j} \sum_j y_i y_j w_{ij} \sum x_i y_j$

87. $\Delta E=$

a. $-[\sum_j (y_j w_{ij} + x_i - \theta_i \Delta y_i]$

b. $-[\sum_j (y_j w_{ij}) \Delta y_i]$

c. $-[\sum_j (x_i - \theta_i) \Delta y_i]$

d. $-[\sum_j (y_j w_{ij} + \Delta y_i]$

88. The essence ofa CAM is to map the following onto a fixed (stable) point

a. Output

b. Fundamental memory

c. Main memory

d. Additional memory

89. The energy cannot increase for both positive and negative change in y_i, the value ofΔE isa. less than

zero

b. Greater than zero

c. Equal to zero

d. Infinity

90. In the following mode oftraining, all neurons in Hopfield networks fire at random.

a. Stable state

b. Output

c. Synchronous

d. Asynchronous

91. The change in energy is due to a change in the

a. Time of training

b. State of neuron

c. Number of neurons present

d. Weight

92. If the energy doesn t change with further iteraWon then the net reaches

a. State equilibrium

b. State inequilibrium

c. State annealing

d. State instability

93. The formulation ofthe following nets shows the usefulness ofnet as a content addressable memory a. Discrete

Hop

b. Continuous Hop

c. Discrete BAM

d. Continuous BAM

94. The function is used to prove the stability ofrecurrent network

a. Time

b. Energy

c. Sigmoid

d. Pressure

95. Four neurons have the following number of probable states.

a. 8

b. 16

c. 32

d. 64

96. The fuzziness ofthe data can bedecreased by

a. Decreasing the weighting factor W

b. Increasing the weighting factor W

c. Doesn't change with weighting factor

d. Keeping the weighting factor constant

97. The most famous fuzzy clustering procedure in the literatureis

a. k-means algorithm

b. DB-scan algorithm

c. Fuzzy-c-means algorithm

d. Gaussian algorithm

98. The sum ofmemberships ofall elements in a cluster is always

a. 0

b. -1

c. 1

d. Variable

99. The fuzziness ofthe data can beincreased bya.

Decreasing the weighting factor W

b. Increasing the weighting factor W

c. Doesn't change with weighting factor

d. Keeping the weighting factor constant

100. Fuzzy clustering can also betermed as a.

Overlapping clustering

b. Exclusive clustering

c. Hierarchical clustering

d. Probabilistic clustering

101. Fuzzy Classification can beapplied

a. Only to Fuzzy Data

b. Only to Crisp Data

c. Can beapplied to any type ofData

d. Only to Graphical Data

102. The main advantage ofFuzzy Classification is

a. Features in linguistic forms can beconverted toMathematical values

b. Features can be modeled with probabilistic functions

c. Features can be modeled directly with block diagram

d. Features can be modeled graphically

103. Fuzzy classification is implemented using

a. Only Crisp logic

b. Only Fuzzy logic

c. Both Crisp and Fuzzy logic

d. Only Predicate Logic

104. The weighting factor W Accounts for the a.

Fuzziness ofdata

b. Exactness of data

c. Probability of data

d. Distinct nature of data

105. Biggest application offuzzy classification isa. Data

mining

b. Image Processing

c. Geographical information system

d. Medical analysis

106. Limitation offuzzy classification is

a. Low dimensional data

b. High dimensional data

c. Trained data

d. Uncertain data

107. Half tea spoon sugar placed in tea implies

a. Sweetness is 0.5

b. Probability of sweetness is 0.5

c. Sweetness feature can be modeled with a membership 0.5

d. Sweetness feature can bemodeled with a membership 0.5 Sweetness is 0.5

108. The classes in fuzzy classification are

a. Exact

b. Distinct

c. Distinct but overlapping

d. Only overlapping

109. Fuzzy classification is a

a. Decision based application

b. Rule based application

c. Branching application

d. Both decision based and rule based

110. Fuzzy membership functions can be

a. Only distinct

b. Only continuous

c. Only graphical

d. Can bedistinct and continuous

111. The output ofthe fuzzy classifier is determined bythe rule which has

a. Lowest degree of membership

b. Highest degree ofmembership

c. 0 degree membership

d. Exactly 0.5 membership

112. The partitioning of data in fuzzy classification is usually carried bya.

Clustering

b. Probability

c. Statistical analysis

d. Regression

113. The goal offuzzy classification is

a. To cluster the data

b. To find highest memberships

c. To implement fuzzy logic

d. Tocreate category memberships

114. The use offuzzy classification to ordinary classification is to get

a. Fixed range of values

b. Overlapping range ofvalues

c. Exact values

d. Optimal values

115. Biggest application offuzzy classification isa. Data

mining

b. Image Processing

c. Geographical information system

d. Medical analysis

116. If 0≤ µı (x) then T (P)

a. µı (x)

b. P

c. 0

d. 1

117. B'=

a. ı' O X(x,y)

b. ı' U X(x,y)

c. ı' || X (x,y)

d. ı'

118. µB c (y)=

a.

b.

c.

d.

119. Absolute fuzzy quantifiers are defined over

a. R

b. 0

c. 1

d. α

120. Fuzzy inference also referred to as a.

Approximate reasoning

b. Abductive reasoning

c. Inductive reasoning

d. Default logic

121. The following is a statement which acquires a fuzzy truth value

a. Fuzzy preposition

b. Fuzzy predicate

c. Binary value

d. Real value

122. GMP stands for

a. Generalized Modus Ponens

b. Generalized Modus Potent

c. Generalized Modus Point

d. Generalized Modus Potential

123. GMT stands for

a. Generalized Modus Tag

b. Generalized Modus Tollens

c. Generalized Modus Thrice

d. Generalized Modus Threat

124. μ(x,y) =

a. μx (x,y)

b. μ x (x)

c. μ x (y)

d. μ (x,y)

125. μı*ı (x,y)=

a. Min(μı (x), μı (y))

b. Max(μı (x), μı (y))

c. Min(μı (x),μı (x))

d. Min(μı (y), μı (y))

126. μ(x,y) =

a. Max (μ (x,y), μ(x,y))

b. Min (μ (x,y), μ (x,y))

c. 1-μ (x,y)

d. 1-μ (x,y)

127. μ∩ (x,y) =

a. Max (μ X (x,y),μ (x,y))

b. Min (μ X (x,y), μ (x,y)) c.

1-μ (x,y)

d. 1- μ (x,y)

128. μc (x,y)=

a. Max (μ (x,y), μ (x,y))

b. Min (μ (x,y), μ (x,y))

c. 1-μ (x,y)

d. 1- μ (x,y)

129. **The following is fuzzy set defined on Cartesian product ofcrisps set X1, X2,Xn where the ntuple**

(X1,X2,Xn) may have varying degree of membership with in the relation

a. Fuzzy Relation

b. Crisp Relation

c. Cartesian

d. Function

130. μo (x,z) =

a. yεY Max(Min (μ (x,y), μ(y,z)))

b. yεY Min(Min (μ (x,y), μ (y,z)))

c. yεY Max(Max (μ (x,y), μ (y,z)))

d. yεYMin(Max (μ (x,y), μ (y,z))) 131. μa (x) =

a. a+ μ (x)

b. a* μ(x)

c. μ (x)

d. μ (x)-a

132. μAα(x) =

a. (μ (x))α

b. μ (x)

c. α

d. α *μ (x)

133. c =

a. ≠ X

b. = X

c. {}

d. Ac

134. If A={(x1,0.5), (x2, 0.7), (x3, 0)} and {(x1,0.8), (x2, 0.2), (x3, 1)} then ı ı is

a. {(x1,0), (x2, 1), (x3, 0)}

b. {(x1,0.8), (x2, 0.7), (x3, 1)}

c. {(x1,0.1), (x2, 0.1), (x3, 1)}

d. {(x1,1.3), (x2, 0.9), (x3,)}

135. If A={(x1,0.5), (x2, 0.7), (x3, 0)} and {(x1,0.8), (x2, 0.2), (x3, 1)} then ı ∩ ı is

a. {(x1,0), (x2, 1), (x3, 0)}

b. {(x1,0.5), (x2, 0.2), (x3, 0)}

c. {(x1,0.1), (x2, 0.1), (x3, 1)}

d. {(x1,1.3), (x2, 0.9), (x3,)}

136. If A={(x1,0.5), (x2, 0.7), (x3, 0)} and {(x1,0.8), (x2, 0.2), (x3, 1)} then µı ı(x2)=

a. 0.1

b. 0.5

c. 0.2

d. 0

137. The product oftwo fuzzy set ı and ı whose membership function defined as µı.ı (x)

a. µı(x) . µı(x)

b. µı(x) + µı(x)

c. µı(x) - µı(x)

d. µı(x) / µı(x)

138. If ı={(x1,0.2), (x2, 0.8), (x3, 0.4)} ı= {(x1,0.4), (x2, 0), (x3, 0.1)} then ı.ı

a. {(x1,0.6), (x2, 0.8), (x3, 0.5)}

b. {(x1,0.08), (x2, 0), (x3, 0.04)} c.

{(x1,0.01), (x2, 1), (x3, 0.03)}

d. {(x1,0.02), (x2, 2), (x3, 0.01)}

139. If A={(x1,0.5), (x2, 0.7), (x3, 0)} and {(x1,0.8), (x2, 0.2), (x3, 1)} then μı ı(x1)=

a. 0.8

b. 0.5

c. 1.3

d. 1

140. If A={(x1,0.5), (x2, 0.7), (x3, 0)} and {(x1,0.8), (x2, 0.2), (x3, 1)} thenμ ı ı(x2)=

a. 0.2

b. 0.7

c. 0.1

d. 1

141. If A={(x1,0.5), (x2, 0.7), (x3, 0)} and {(x1,0.8), (x2, 0.2), (x3, 1)} thenμ ı ∩ ı(x1)=

a. 0.1

b. 0.5

c. 0.2

d. 0

142. The union oftwo fuzzy sets ı and ı is ı U ı is defined with membership function μA U N

(x) as

a. min (μA(x),μN(x))

b. max (μA(x),μN(x)) c.

abs (μA(x),μN(x))

d. log (µA(x),µN(x))

143. If A={(x1,0.5), (x2, 0.7), (x3, 0)} and {(x1,0.8), (x2, 0.2), (x3, 1)} then µı U ı(x3)=

a. 0

b. 0.1

c. 1

d. 3

144. The intersection oftwo fuzzy sets ı and ı is ı ∩ ı is defined with membership function

µA N (x) as

a. min (µA(x), µN(x))

b. max (µA(x), µN(x))

c. abs (µA(x), µN(x))

d. log (µA(x), µN(x))

145. If A={(x1,0.5), (x2, 0.7), (x3, 0)} and {(x1,0.8), (x2, 0.2), (x3, 1)} then µı U ı(x3)=

a. 0.1

b. 0.5

c. 0.2

d. 0

146. The complement offuzzy set ı is a new fuzzy set ı with the following membership function

a. µı(x) =1- µı(x) b. µı(x) = 1+ µı(x) c. µı(x) = 1* µı(x) d. µı(x) = 1/ µı(x)

147. If ı={(x1,0.5), (x2, 0.7), (x3, 0)} then ıc=

a. {(x1,0.5), (x2, 0.7), (x3, 0)}

b. {(x1,0.5), (x2, 0.3), (x3, 1)} c.

{(x1,0.3), (x2, 0.7), (x3, 0)}

d. {(x1,0.5), (x2, 0.7), (x3, 3)}

148. µıc(x1)=

a. 0.5

b. 0.3

c. 1

d. 1.8

149. µıc (x2)=

a. 0.5

b. 0.3

c. 1

d. 1.8

150. µıc (x3) =

a. 0.5

b. 0.3

c. 1

d. 1.8

151. If µı(x) =µı(x) then the two fuzzy sets ı and ı are said to be a.

Equal

b. Product

c. Union

d. Intersection

152. (ı∩ ı)c =

a. ı∩ ı

b. ıc ∩ ıc

c. ıc∩ ı

d. ı∩ ıc

153. (ı ı)c =

a. ı ı

b. ıc ıc

c. ıc ı

d. ı ıc

154. ı ıc =

a. ≠ X

b. = X

c. {}

d. Ac

155. If ı={(x1,0.4), (x2, 0.2), (x3, 0.7)} and α=2 then (ı)2=

a. {(x1,0.16), (x2, 0.04), (x3, 0.49)}

b. {(x1,0.4), (x2, 0.2), (x3, 0.7)}

c. {(x1,0.2), (x2, 0.1), (x3, 0.1)}

d. {(x1,0.1), (x2, 0.3), (x3, 0.7)}

156. If ı={(x1,0.4), (x2, 0.2), (x3, 0.7)} and α=2 then µı2(x3)=

a. 0.16

b. 0.04

c. 0.49

d. 0.01

157. The disjunctive some oftwo fuzzy set ı and ı as ıΘ ı isa. (ıc∩

ı) (ı∩ ıc)

b. (ıc∩ ıc) (ı∩ ıc)

c. (ıc∩ ı) (ıc∩ ıc)

d. (ıc∩ ı) ∩ (ı∩ ıc)

158. µ a.ı(x) =

a. a+ µı(x)

b. a* µı(x) c.

µı(x)

d. µı(x)-a

159. µAα(x) =

a. (µı(x))α

b. µı(x)

c. α

d. α * µı(x)

160. Raising the fuzzy set to its second power is called a.

Concentration

b. Dilution

c. Dilation

d. Convolution

161. Taking the square root of fuzzy set is called

a. Concentration

b. Dilution

c. Dilation

d. Convolution

162. The difference ı- ı =

a. ı∩ ı b.

(ı ıc) c.

(ı∩ ıc)

d. ıc∩ ıc

163. If ı= {(x1,0.2), (x2, 0.5), (x3, 0.6)} ı= {(x1,0.1), (x2, 0.04), (x3, 0.5)} then ı =

a. {(x1,0.2), (x2, 0.5), (x3, 0.6)}

b. {(x1,0.1), (x2, 0.5), (x3, 0.6)}

c. {(x1,0.2), (x2, 0.5), (x3, 0.5)} d.

{(x1,0.1), (x2, 0.3), (x3, 0.6)}

164.c=

a. ≠ X

b. = X

c. {}

d. Ac

165. In the discrete case fuzzy set is defined as

a. A= ΣxiεX μ (xi) /xi

b. A= ΣxiεX (xi) /xi

c. A= ΣxiεX μ /xi

d. A= ΣxiεX μ (xi) * xi

166. In the continuous case fuzzy set as a.

A= xζμ(x)/x

b. A= xζ (x)/x

c. A= xζ μ (x)+x

d. A= xζ μ (x)*x

167. The following is associated with fuzzy set A such that the function maps every elements ofthe universe of

discourse X to the interval [0,1]

a. Threshold function

b. Membership function

c. Sigmoid function

d. Hyperbolic

168. Mathematically membership function isa. μ

=1/(1+x)2

b. μ =(1+x)2

c. μ = x2

d. μ =1+x

169. If ı ={(x1,0.2), (x2 0.8)} ı= {(x1,0.6), (x2, 0.8)}, ı= {(x1,0.2), (x2, 0.8)} then

a. ı= ı

b. ı` ı

c. ı= ı

d. ı= 3ı

170. If ı ={(x1,0.2), (x2 0.8)} ı= {(x1,0.6), (x2, 0.8)}, ı= {(x1,0.2), (x2, 0.8)} then

a. ı= ı

b. ı≠ ı

c. ı= ı

d. ı= 3ı

171. The following sets support a flexible sends of membership ofelements to a set a. Fuzzy set

b. Logic set

c. Certain set

d. Crisp set

172. In the following set theory anelement either belong to ordoesn t belong to a set

a. Fuzzy set

b. Logic set

c. Certain set

d. Crisp set

173. In the following set theory many degrees of membership are allowed

a. Fuzzy set

b. Logic set

c. Certain set

d. Crisp set

174. The following function values need not always be described bydiscrete values

a. Membership

b. Index

c. Position

d. Class

175. If ={(x1,0.2), (x2, 0.8)} ={(x1,0.6), (x2, 0.8)}, = {(x1,0.2), (x2, 0.8)} then

a. =

b. ≠

c. =

d. = 3

176. The following logic had its roots in the theory ofcrisp sets

a. Fuzzy logic

b. Boolean logic

c. Prolog

d. ELIZA

177. Uncertainty arises due to following

a. Complete information

b. Partial information

c. Clear information

d. Coherent information

178. The statements of(0 /1)type ofhandling is termed as the following the domain offuzzy set theory

a. Crisp

b. Lisp

c. Prolog

d. ELIZA

179. Crisp logic is of

a. Single valued

b. Multivalued

c. Ambiguious valued

d. Non defined valued

180. Fuzzy logic is ofa.

Single valued

b. Multivalued

c. Ambiguious valued

d. Non defined valued

181. The following logic is oftwo values

a. Crisp logic

b. Fuzzy logic

c. Bayes logic

d. Probability theory

182. In the following logic truth values are multi valued

a. Crisp logic

b. Fuzzy logic

c. Predicate logic

d. Prepositional logic

183. The following theory is anexcellent mathematical tool to handle the uncertainty arising due to vagueness

a. Fuzzy set theory

b. Crisp logic

c. Classical set theory

d. Prepositional logic

184. The following may arise due to partial information about the problem

a. Clarity

b. Uncertainty

c. Perfection

d. Unambiguity

185. Classical set theory also termed as a.

Crisp

b. Lisp

c. Prolog

d. ELIZA

186. Number ofpictures that can be stored at a time isa.

Only one

b. Two

c. Any number of pictures

d. It depends on training

187. If bipolar patterns are used

a. P=n/(log2n)

b. P=n/(log2n)

c. P=2n/(2log2n)

d. P=3n/(2log2n)

188. The Hopfield network consists ofa set ofneurons forming a multiple loop of following system.

a. Unidirectional

b. Parallel

c. Feedback

d. Feed forward

189. The magnetic mutual exchange between the alones led to the development of

a. Simulated annealing

b. McCulloh piths

c. Hopfield

d. Boltzmann's Machine

190. The following network is able to recognize unclear pictures correctly

a. Simulated annealing

b. McCulloh Pitts

c. Hopfield

d. Boltzmann's Machine

191. In Hopfield net

a. Only one unit updates its activation at a time

b. Many units

c. Does not update at all

d. Activation function is not present

192. In Hopfield net the number ofbinary patterns that can bestored and recalled ina net with

reasonable accuracy a given by

a. P ≈ 0.15n

b. P ≈ 0.25n

c. P ≈ 0.35n

d. P ≈ 0.5n

193. The following sets have a tendency to stabilize to a local minima rather than global minima a. Hopfield

b. BAM

c. Boltzmann's machine

d. ART1

194. In the following network anindividual units doesn t connect to itself

a. Hopfield

b. BAM

c. Boltzmann's machine

d. ART1

195. Simulated annealing, Boltzmann s Machine, Hopfield nets belongs to

a. Feed forward

b. Feedback

c. Feed follow

d. Adhoc

196. The asynchronous discrete time updating ofthe units allows a function known as [b]

a. Time function

b. Energy function

c. Memory for

d. Signal function

197. Energy function is also called as the following function to befound for net

a. Boltzmann s Machine

b. Lyapnuov function c.

Sigmoid function

d. Threshold function

198. The following functions proves that the net will converge to a stable set ofactuations

a. Boltzmann's Machine

b. Lyapnuov function c.

Sigmoid function

d. Threshold function

199. Hop field network is

a. Feed forward

b. Feed back

c. Feed follow

d. Adhoc

200. In the following mode oftraining, all neurons in Hopfield networks fire at the same time.

a. Stable state

b. Output

c. Synchronous

d. Asynchronous

201. If |A| =n then |P (A)|=

a. 2n

b. 2n

c. n2

d. n + n

202. The value of|A| in singleton set Aisa. 1

b. 0

c. 5

d. Depends on the number of elements in A

203. X={1,2,3,4,5,6,7} and A= {5, 4,3} then Ac=

a. {1,2,6,7}

b. {1,2,3,4}

c. {6,7}

d. {5}

204. If A={a,b,c,1,2} B={1,2,3,a,c} then A∩ B=

a. {a,c,1,2}

b. {a,b,c}

c. {a,c}

d. {}

205. Given A={a,b,c,1,2} B={1,2,3,a,c} then AB=

a. {a,b.c,1,2,3}

b. {a,b,c}

c. {1,2,3}

d. {}

206. The complement ofset A is denoted by

a.

b. Ac

c. and Ac

d. A

207. If A∩ B=ϕ then the two sets are

a. Joint

b. Disjoint

c. Subsets

d. Supersets

208. If A= {a,b,c,d,e} B={b,d} then A-B=

a. {a,c,e}

b. {a,c}

c. {a}

d. {d}

209. If |A| = 4 then |P (A)|=

a. 16

b. 4

c. 10

d. 8

210. A∩ Ac = ϕ is

a. Commutative

b. Associative

c. Distributive

d. Law of contradiction

211. According to Demorgan's laws (AB)c =

a. Ac Bc

b. A Bc

c. Ac B

d. Ac∩ Bc

212. According to Demorgan's laws (A∩B)c=

a. Ac Bc

b. A Bc

c. Ac B

d. Ac∩ Bc

213. Partition on A indicated as π (A) is therefore for each pair (i,j)εI for i≠j

a. Ai ∩ Aj =θ

b. iεJ ∩ Ai =A

c. iεJ ∩ Ai =1

d. iεJ ∩ Ai =0

214. The following on A is defined to a set ofnon empty subsets Ai, whose union yields the original set A

a. Partition

b. Covering

c. Opening

d. Closing

215. The following on A is defined to a set ofnon empty subsets Ai, each ofwhich is pair wise disjoint and whose union yields the original set A

a. Partition

b. Covering

c. Opening

d. Closing

216. |A| = | i=1..n Ai|=Σi=1..n|Ai| isa.

Rule ofaddition

b. Rule of inclusion

c. Rule of exclusion

d. Rule of application

217. If the subsets are not pair wise disjoint then the following is not applicable on the covering of set A

a. Rule of addition

b. Rule of inclusion

c. Rule of exclusion

d. Rule of application

218. AB= B Ais the following property of set a.

Commutative

b. Associative

c. Distributive

d. Idempotence

219. A A= Ais the following property ofset

a. Commutative

b. Associative

c. Distributive

d. Idempotence

220. A∩ (B C) =(A∩ B)(A∩ C) is the following property ofset

a. Commutative

b. Associative c.

Distributive d.

Idempotence

221. A∩ E= Ais the following property ofset

a. Commutative

b. Associative

c. Distributive

d. Identity

222. A(A∩ B)= Ais the following property ofset

a. Commutative

b. Associative

c. Distributive

d. Law of absorption

223. If A≤ B, B≤C then A ≤ C is

a. Commutative

b. Associative

c. Distributive

d. Transitive

224. (Ac)c=A is the following property

a. Commutative

b. Associative

c. Distributive

d. Involution

225. AAc = Eis

a. Commutative

b. Associative

c. Distributive

d. Law of excluded middle

226. In discrete BAM for Binary input vectors, the weight matrix can bedetermined bythe formula

a. Wij=Σ p (2Si(p)-1) (2tj(p)-1)

b. Wij=Σ p (2Si(p)+1) (2tj(p)-1)

c. Wij=Σ p (2Si(p)-1) (2tj(p)+1)

d. Wij=Σ p (2Si(p)+1) (2tj(p)+1)

227. In discrete BAM for Bipolar input vectors, the weight matrix can bedetermined bythe formula

a. Wij=Σ p Si(p) 2tj(p)

b. Wij=Σ p (2Si(p)+1) (2tj(p)-1)

c. Wij=Σ p (2Si(p)-1) (2tj(p)+1)

d. Wij=Σ p (2Si(p)+1) (2tj(p)+1)

228. In continuous BAM for binary input vectors the weights are determined bythe formulae

a. Wij=Σ p (2Si(p)-1) (2tj(p)-1)

b. Wij=Σ p (2Si(p)+1) (2tj(p)-1)

c. Wij=Σ p (2Si(p)-1) (2tj(p)+1)

d. Wij=Σ p (2Si(p)+1) (2tj(p)+1)

229. Logistic sigmoid activation function in Y layer is given bya. f(yin j)=1/(1+exp(-yin j)

b. f(yin j)=1+(1+exp(-yin j)

c. f(yin j)=1-(1+exp(-yin j)

d. f(yin j)=1*(1+exp(-yin j)

230. If the net input is equal to the threshold value, the activation function decide to

a. Leaves the activation of that unit to higher value

b. Leaves the activation of that unit to previous value

c. Zero

d. One

231. The following memory has the capability to transfer the input smoothly and continuously into

respective output in the range between [0,1]

a. Continuous BAM

b. Discrete BAM

c. Hetero associative memory

d. Auto associative memory

232. The continuous BAM uses the following function asthe activation function

a. Step activation with Zero threshold

b. Step activation with non-zero threshold

c. Logistic sigmoid function

d. Hyperbolic tangent function

233. If bias is included in calculating the net input in Y layer then $f(y_{in\,j})$

a. $f(y_{in\,j}) = b_j + \Sigma x_i W_{ij}$

b. $f(y_{in\,j}) = b_j - \Sigma x_i W_{ij}$

c. $f(y_{in\,j}) = \Sigma x_i W_{ij}$

d. $f(y_{in\,j}) = b_j + \Sigma W_{ij}$

234. Bidirectional associative memory is developed by

a. Rumelhar

b. Wilson c.

Hecht

d. Kosko

235. BAM is

a. Auto Associative recurrent network

b. Hetero Associative recurrent network

c. Hop field network

d. Perceptron

236. Different forms of BAM are

a. Only binary

b. Only Bipolar

c. Only continuous

d. Binary, Bipolar, continuous

237. The activation function used in discrete BAM is

a. Step activation with Zero threshold

b. Step activation with non-zero threshold

c. Logistic sigmoid function

d. Hyperbolic tangent function.

238. The continuous BAM was introduced by

a. Rumelhart

b. Neilson

c. McCulloh

d. Kosko

239. The difference between the number ofbits in two binary orbipolar vectors x1 and x2 is called

a. Hamming distance

b. Euclidean distance

c. Mean distance

d. Variance

240. The average hamming distance between the vectors is

a. 1/n [HD(x1,x2)]

b. 1/2n [HD(x1,x2)]

c. 1/3n [HD(x1,x2)]

d. 1/2 [HD(x1,x2)]

20. Tutorial Problems

1. Neural Network Fundamentals with Graphs, Algorithms, and Applications.

2. Stochastic Neuron model.

3. Neural Networks for Modelling and Control of Dynamic Systems.

4. Neural Network Design.

5. Fuzzy and Neural Approaches in Engineering.

6. Fuzzy Modeling for Control.

21. Known Gaps if any

Known gaps:No gaps

Action taken:

22. Discussion topics if any (group wise topics)

1. Potential applications of Artificial Neural Network.

2. Types of applications of neural network.

3. Limitations of Perceptron model.

4. Learning improvements

5. Discussion of instance/Memory Based algorithms.

6. Fuzzy logic applications.

7. Types of Membership functions

8. Defuzzification methods.

23.References, Journals, websites and E-links

1. www.iitm.ac.in/resources/nptel/electrical

2. www.iitk.ac.in/electrical

ADDITIONAL TOPICS

1. A HIGH PERFORMANCE INDUCTION MOTOR DRIVE SYSTEM USING FUZZY LOGIC CONTROLLER

2. SPEED CONTROL OF AN INDUCTION MOTOR USING THE FUZZY LOGIC .

REFERENCE BOOKS:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks – Simon Hakins , Pearson Education
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

Websites

1. *ieeexplore.ieee.org*
2. *www.sciencedirect.com/*
3. *www.academia.edu*

24. Quality Measurment Sheets

a. Course and Survey

b. Teaching Evaluation

Student List

Cheeryal (V), Keesara (M). R.R.Dist, A.P 501 301

STUDENT ROLL

No.Admin/B.Tech/SR/26 **Rev. No. 00**

Academic Year: 2014-15 **Date: 25.06.2014**

Class / Section: EEE 41A

SlNo	AdmnNo	StudentName	SlNo	AdmnNo	StudentName
1	09R11A0219	HARINATH PERALI	37	11R11A0237	N RAJASHEKAR REDDY
2	11R11A0201	A.HARITHA	38	11R11A0238	N SURESH
3	11R11A0202	ALLAKONDA SAI KUMAR	39	11R11A0239	NAGULA SWAMY KRANTHI KUMAR
4	11R11A0204	ASHISH YADAV M	40	11R11A0240	NAMA SAMPATH
5	11R11A0205	B.BABITHA	41	11R11A0241	NIKITA DHAND
6	11R11A0206	B KRANTHI KUMAR	42	11R11A0242	P K V N SAI KIRAN
7	11R11A0207	BETHALA NAGARAJ	43	11R11A0243	PAKA SHARATH CHANDRA
8	11R11A0208	BEJJENKI ANIL KUMAR	44	11R11A0244	PAMARTI MONIKA
9	11R11A0209	CHIGURUPALLI SUSHANTH	45	11R11A0245	PARAMKHUSHAM PRANAY
10	11R11A0210	CHINTA HEMA REDDY	46	11R11A0246	PERUMULA NAVEEN VARMA

11	11R11A0211	D SAIRAM GOUD	47	11R11A0247	POLICE PATEL LAVANYA
12	11R11A0212	EADARA SURAJ CHOWDARY	48	11R11A0248	PRATYASHA MISHRA
13	11R11A0213	ELEMASETTY UDAY KIRAN	49	11R11A0249	RAKESH REDDY KATIPELLI
14	11R11A0214	G PRADEEP KUMAR	50	11R11A0250	RAVALASA VENKATESH
15	11R11A0215	GADIYARAM NIKHITHA CHANDRA LEKHA	51	11R11A0251	SANAGAPATI ANUSHA
16	11R11A0216	GAJULAPATI RAJINI	52	11R11A0252	SHAIK AZHARUDDIN
17	11R11A0217	GANGABATHUL A VIJAYA GOWRI DEVI	53	11R11A0253	SHAIK MASTHAN VALI
18	11R11A0218	GATTUPELLY VAMSHIKRISHN A	54	11R11A0254	SRI PRIYA BANDARI
19	11R11A0219	GONA HARI KISHORE REDDY	55	11R11A0255	SUGURU SHILPA
20	11R11A0220	GUDURU ARCHANA	56	11R11A0256	T.PRASHANTH KUMAR REDDY
21	11R11A0221	JATOTH RAHUL	57	11R11A0257	V ANIL KUMAR
22	11R11A0222	K.A GIRISH	58	11R11A0258	VANTHIRI VENKATA KRISHNA

		KUMAR NAIK			
23	11R11A0223	K KEERTHI	59	11R11A0259	VINJAMARA NITHIN
24	11R11A0224	K MOUNIKA	60	11R11A0260	RAMIDI LAVANYA
25	11R11A0225	K. NAGENDRA BABU	61	12R15A0201	C V P KUMAR
26	11R11A0226	K VIKRAM SRIRAM	62	12R15A0202	MANCHICANTI NAGESH
27	11R11A0227	KANDADI SANDEEP REDDY	63	12R15A0203	K INDU
28	11R11A0228	KASOJU BHARATH KUMAR	64	12R15A0204	YEPURI VENKATESH
29	11R11A0229	KONDAPALLI SHIRISHA MANI	65	12R15A0205	SAGI SRIPAL
30	11R11A0230	KUNTA HARIKRISHNA	66	12R15A0206	KETHAVATH MANTHRU
31	11R11A0231	M SHARATH KUMAR	67	12R15A0207	BASABOINA VENKATESH
32	11R11A0232	M.VINOD	68	12R15A0208	BITKURI ANIL KUMAR
33	11R11A0233	M.SREENATH	69	12R15A0209	E PRASANTH
34	11R11A0234	SANDEEP KUMAR M V	70	12R15A0210	PULUGUJJU PHANEDRA KUMAR
35	11R11A0235	MATTA SUMANTH	71	12R15A0211	SRI RAM ANJAIAH BHARATH KUMA

		REDDY			
36	11R11A0236	MOHAMMAD VAZID RUMAN	72	12R15A0212	BOMMANI ASHOK

Total: 72 Males: 55 Females: 17

26. Group-wise students list for discussion topics

GROUP 1

09R11A0219	HARINATH PERALI
11R11A0201	A.HARITHA
11R11A0202	ALLAKONDA SAI KUMAR
11R11A0204	ASHISH YADAV M
11R11A0205	B.BABITHA
11R11A0206	B KRANTHI KUMAR

GROUP 2

11R11A0207	BETHALA NAGARAJ
11R11A0208	BEJJENKI ANIL KUMAR
11R11A0209	CHIGURUPALLI SUSHANTH

11R11A0210	CHINTA HEMA REDDY
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11R11A0214	G PRADEEP KUMAR
11R11A0215	GADIYARAM NIKHITHA CHANDRALEKHA
11R11A0216	GAJULAPATI RAJINI
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11R11A0219	GONA HARI KISHORE REDDY
11R11A0220	GUDURU ARCHANA
11R11A0221	JATOTH RAHUL
11R11A0222	K.A GIRISH KUMAR NAIK
11R11A0223	K KEERTHI
11R11A0224	K MOUNIKA

GROUP 5

11R11A0225	K. NAGENDRA BABU
11R11A0226	K VIKRAM SRIRAM
11R11A0227	KANDADI SANDEEP REDDY
11R11A0228	KASOJU BHARATH KUMAR
11R11A0229	KONDAPALLI SHIRISHA MANI
11R11A0230	KUNTA HARIKRISHNA

GROUP 6

11R11A0231	M SHARATH KUMAR
11R11A0232	M.VINOD
11R11A0233	M.SREENATH
11R11A0234	SANDEEP KUMAR M V
11R11A0235	MATTA SUMANTH REDDY
11R11A0236	MOHAMMAD VAZID RUMAN

GROUP 7

11R11A0237	N RAJASHEKAR REDDY
11R11A0238	N SURESH
11R11A0239	NAGULA SWAMY KRANTHI KUMAR

11R11A0240	NAMA SAMPATH
11R11A0241	NIKITA DHAND
11R11A0242	P K V N SAI KIRAN

GROUP 8

11R11A0243	PAKA SHARATH CHANDRA
11R11A0244	PAMARTI MONIKA
11R11A0245	PARAMKHUSHAM PRANAY
11R11A0246	PERUMULA NAVEEN VARMA
11R11A0247	POLICE PATEL LAVANYA
11R11A0248	PRATYASHA MISHRA

GROUP10

11R11A0249	RAKESH REDDY KATIPELLI
11R11A0250	RAVALASA VENKATESH
11R11A0251	SANAGAPATI ANUSHA
11R11A0252	SHAIK AZHARUDDIN
11R11A0253	SHAIK MASTHAN VALI
11R11A0254	SRI PRIYA BANDARI

GROUP 11

12R15A0201	C V P KUMAR
12R15A0202	MANCHICANTI NAGESH
12R15A0203	K INDU
12R15A0204	YEPURI VENKATESH
12R15A0205	SAGI SRIPAL
12R15A0206	KETHAVATH MANTHRU

GROUP 12

12R15A0207	BASABOINA VENKATESH
12R15A0208	BITKURI ANIL KUMAR
12R15A0209	E PRASANTH
12R15A0210	PULUGUJJU PHANEDRA KUMAR
12R15A0211	SRI RAM ANJAIAH BHARATH KUMAR
12R15A0212	BOMMANI ASHOK