



INSTITUTE OF AERONAUTICAL ENGINEERING

Dundigal, Hyderabad - 500 043

COMPUTER SCIENCE AND ENGINEERING

QUESTION BANK

Course Title	SOFT COMPUTING
Course Code	BCS208
Regulation	IARE - R18
Class	M. Tech II Semester
Year	2018 – 2019
Course Faculty	Ms. K. Sai Saranya, Assistant Professor, Dept. of CSE.

COURSE OBJECTIVES:

The course should enable the students to:

I.	Familiarize with soft computing concepts.
II.	Understand supervised learning and unsupervised learning networks.
III.	Introduce the ideas of neural networks, fuzzy logic.

COURSE LEARNING OUTCOMES:

At the end of the course the students are able to:

S. No	Description
BCS208.01	Understand literature of neural networks.
BCS208.02	Understand and develop learning techniques
BCS208.03	Retrieve linear equations and Understand back propagation
BCS208.04	Understand associative memory types.
BCS208.05	Understand the concept of regression analysis to find the hidden relations in data.
BCS208.06	Understand the concepts of unsupervised learning
BCS208.07	Understand the concepts of fuzzy sets and relations
BCS208.08	Identify iterative and non-iterative fuzzy sets.
BCS208.09	Understand methods of defuzzification.
BCS208.10	Develop truth tables of fuzzy logic.
BCS208.11	Understand formation rules and aggregation rules
BCS208.12	Develop fuzzy interface system and fuzzy expert system
BCS208.13	Understand genetic algorithms, constraints and classifications.
BCS208.14	Understand the fusion approach.

PART – A (SHORT ANSWER QUESTIONS)

S. No	QUESTIONS	Blooms taxonomy level	Course outcome
UNIT –1 INTRODUCTION TO NEURAL NETWORK			
1.	List Neuro Fuzzy and soft computing characteristics.	Remember	1
2.	Define perceptron.	Remember	2
3.	What is back propagation?	Understand	3
4.	Describe the list of neural network applications.	Understand	2
5.	Why are linearly separable problems of interest of neural network researchers?	Remember	2
6.	What is Hebb’s rule?	Understand	2
7.	What is a McCulloch-Pitts neuron?	Understand	1
8.	What is supervised learning?	Remember	4
9.	What are the basic learning laws?	Understand	3
10.	What is soft computing?	Understand	3

PART – B (LONG ANSWER QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT –1 INTRODUCTION TO NEURAL NETWORK			
1.	Give a brief note on evolution of neural networks.	Knowledge	5
2.	Explain various models of ANN.	Remember	8
3.	With a neat sketch explain McCulloch and Pitts neuron.	Knowledge	6
4.	Develop a back propagation algorithm.	Apply	8
5.	Write a short note on supervised learning.	Knowledge	8
6.	Explain multiple adaptive linear network.	Knowledge	7
7.	Explain adaptive linear neuron.	Understand	9
8.	What is radial basis function network? Explain.	Knowledge	9
9.	Explain briefly the operations of biological neural networks.	Remember	9
10.	Compare biological neural network and artificial neural network.	Understand	5

PART – C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT –1			
INTRODUCTION TO NEURAL NETWORK			
1.	Find the output for a 4-input neuron has weights 1, 2, 3 and 4. The transfer function is linear with the constant of proportionality being equal to 2. The inputs are 4, 10, 5 and 20 respectively.	Apply	8
2.	What are the advantages of neural networks over conventional computers?	Apply	9
3.	<p>The network shown in Figure 1 is trained to recognize the characters H and T as shown below:</p> <p>INPUT OUTPUT INPUT OUTPUT</p> <p>If the following pattern was given</p> <p>INPUT OUTPUT</p> <p>What would be the output of the network?</p>	Apply	8
4.	With a supervised learning algorithm, we can specify target output values, but we may never get close to those targets at the end of learning. Give two reasons why this might happen.	Apply	9
5.	Why does a time-delay neural network (TDNN) have the same set of incoming weights for each column of hidden units?	Apply	8
6.	Draw the weight matrix for a feed forward network, showing the partitioning. You can assume that the weight matrix for connections from the input layer to the hidden layer is With, and that the weight matrix for connections from the hidden layer to the output layer is Who.	Apply	9
7.	<p>In a Jordan network with i input neurons, h hidden layer neurons, and o output neurons:</p> <p>(a) how many neurons will there be in the state vector, and</p> <p>(b) if $i = 4$, $h = 3$, and $o = 2$, draw a diagram showing the connectivity of the network. Do not forget the bias unit.</p>	Apply	9
8.	Why does a time-delay neural network (TDNN) have the same set of incoming weights for each column of hidden units?	Apply	8
9.	With a supervised learning algorithm, we can specify target output values, but we may never get close to those targets at the end of learning. Give two reasons why this might happen?	Apply	9
10.	Distinguish between a feed forward network and a recurrent network.	Apply	8

PART – A (SHORT ANSWER QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT – II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING			
1.	State the advantages of the associative memory.	Understand	3
2.	What is content addressable memory?	Understand	3
3.	What are the two types of Hopfield network?	Understand	3
4.	Briefly explain the term <i>code book</i> in the context of learning vector quantization.	Understand	3
5.	What is hetro associative memory network?	Understand	3
6.	Describe the relationship between the Self-Organizing Map algorithm, and the Learning Vector	Understand	3
7.	Give a brief note on counter propagation networks.	Understand	3
8.	Define ART.	Remember	3
9.		Remember	3
10.			

PART – B (LONG ANSWER QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT – II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING			
1.	Write R program to extract sample XML data from web and steps to convert as data frame. Specify the needed packages and functions.	Understand	3
2.	Distinguish simple and multiple regression analysis and its applications working with numerical and categorical data?	Apply	3
3.	What are residuals? Define in Regression analysis.	Understand	3
4.	Generate prediction model using linear regression for finding relative relation among variables. Write a R script to get a linear equation $y=mx+c$ form for the heart weight and body weight in cats dataset.	Apply	3
5.	Write R program to perform the following: i. Find the correlation matrix of iris data set ii. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data. Perform analysis of covariance	Apply	3
6.	Compute the covariance matrix and correlation matrix for the four numerical attributes. Interpret the statistical findings to know more about hidden nature in data.	Remember	
7.	Explain the Hebb rule training algorithm used in pattern association.	Apply	
8.	Write a R script to connect with Excel, read the contents of sheet and load into R object.	Remember	

9.	Draw and explain the architecture of auto associative memory network.	Knowledge	
10.	Write a R program to perform the following: i. Import a data from web storage. ii. Name the dataset with suitable identifier iii. Perform Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Check the model is fit or not.	Apply	

PART – C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT – II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING			
1.	A 4-input neuron has weights 1, 2, 3 and 4. The transfer function is linear with the constant of proportionality being equal to 2. The inputs are 4, 10, 5 and 20 respectively. The output will be:	Apply	9
2.	Describe the architecture and the computational task of the NetTalk neural network.	Apply	8
3.	Why does a time-delay neural network (TDNN) have the same set of incoming weights for each column of hidden units?	Understand	9
4.	Distinguish between a <i>feed forward network</i> and a <i>recurrent network</i> .	Apply	8
5.	Draw the weight matrix for a feedforward network, showing the partitioning. You can assume that the weight matrix for connections from the input layer to the hidden layer is W_{ih} , and that the weight matrix for connections from the hidden layer to the output layer is W_{ho} .	Apply	9
6.	if $i = 4$, $h = 3$, and $o = 2$, draw a diagram showing the connectivity of the network. Do not forget the bias unit.	Apply	8
7.	Draw a diagram illustrating the architecture of Elman’s simple recurrent network that performs a temporal version of the XOR task. How are the two inputs to XOR provided to this network?	Apply	9
8.	Draw an architectural diagram of a rank 2 tensor product network where the dimensions of the input/output vectors are 3 and 4. You do not need to show the detailed internal structure of the binding units.	Apply	9

PART – A (SHORT ANSWER QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT – III FUZZY LOGIC			
1.	Define fuzzy set theory.	Remember	3, 4
2.	Describe fuzzy union with example.	Understand	4
3.	Discuss fuzzy number with respect to membership function.	Understand	3
4.	Give brief note on lambda cuts for fuzzy sets.	Remember	3
5.	What is fuzzy tautology?	Remember	3
6.	Define FCM.	Remember	4
7.	What do you understand by uncertainty?	Remember	4
8.	Define fuzzy relations.	Remember	4
9.	What is fuzzy rule based system?	Remember	3
10.	Define fuzzy ordering.	Understand	3

PART – B (LONG ANSWER QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT – III FUZZY LOGIC			
1.	Find the suitable Machine learning algorithm for the following real time problems: i. Predicting Housing Prices ii. Analyzing Sentiment iii. Finding Similar Documents iv. Recommending Products	Apply	3
2.	How can you identify, the best fit data model from the given dataset.	Apply	3
3.	Describe the prediction model in terms of the following measures for best fit: Residual standard error, Multiple R-squared, F-statistic, p-value	Apply	7
4.	State the suitable classification algorithm for pima Indian diabetes dataset classification. Improve the accuracy by performing multiple preprocess steps.	Apply	4
5.	Calculate the Minkowski distances among objects for $X = \begin{pmatrix} 1 & 3 & 1 & 2 & 4 \\ 1 & 2 & 1 & 2 & 1 \\ 2 & 2 & 2 & 2 & 2 \end{pmatrix}$	Apply	4
6.	What is tolerance? Describe equivalence relations.	Apply	6

7.	What is the purpose of defuzzification? Name at least one method used for defuzzification	Apply	5
8.	Explain the methods of membership value assignments.	Apply	7
9.	What is non iterative fuzzy sets? Explain Fuzzification methods.	Apply	8
10.	Define lambda cuts for fuzzy sets. Explain.	Apply	6

PART – C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT – III FUZZY LOGIC			
1.	Write down the energy function of a BSB network with weight matrix W , feedback constant β , and activation vector x .	Apply	5
2.	Explain Sigmoidal neurons	Apply	6
3.	In a 2-D self-organizing map with input vectors of dimension m , and k neurons in the map, how many weights will there be?	Apply	8
4.	Design a minimum distance classifier with three classes using the following training data: Class 1: $\begin{bmatrix} -1.0 \\ -0.5 \end{bmatrix}$, $\begin{bmatrix} -1.0 \\ -1.5 \end{bmatrix}$ Class 2: $\begin{bmatrix} 1.0 \\ 0.5 \end{bmatrix}$, $\begin{bmatrix} 1.0 \\ -0.5 \end{bmatrix}$ Class 3: $\begin{bmatrix} -1.0 \\ 0.5 \end{bmatrix}$, $\begin{bmatrix} -1.0 \\ 1.5 \end{bmatrix}$ Then classify the test vector $[0.5, -1]^T$ with the trained classifier. Which class does this vector belong to?	Apply	9
5.	The decision function for a minimum distance classifier is $d_j(x) = x^T m_j - 1/2 m_j^T m_j$ where m_j is the prototype vector for class j . What is the value of the decision function for each of the three classes in above question for the test vector $[0, -0.5]^T$?	Apply	7

PART – A (SHORT ANSWER QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT – IV FUZZY ARITHMETIC			
1.	What is binary fuzzy relation?	Remember	3, 4
2.	Define fuzzy reasoning.	Understand	4
3.	Describe single input single output mamdani fuzzy model.	Understand	3
4.	What is sequence of steps taken in designing a fuzzy logic machine?	Remember	3
5.	What is the main difference between the probability and fuzzy	Remember	3
6.	What is an adaptive fuzzy system?	Remember	4
7.	What is the principle of fuzzy logic?	Remember	4
8.	What is a fuzzy variable?	Remember	4
9.	Name three strengths and three weaknesses of fuzzy expert systems.	Remember	3
10.	What is the purpose of defuzzification? Name at least one method used for defuzzification.	Understand	3

PART – B (LONG ANSWER QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT – IV FUZZY ARITHMETIC			
1.	Find the suitable Machine learning algorithm for the following real time problems: i. Predicting Housing Prices ii. Analyzing Sentiment iii. Finding Similar Documents iv. Recommending Products	Apply	3
2.	How can you identify, the best fit data model from the given dataset.	Apply	2
3.	Describe the prediction model in terms of the following measures for best fit: Residual standard error, Multiple R-squared, F-statistic, p-value	Apply	3
4.	How to evaluate hypothesis of the given problem. Describe the basic principle of sampling theory.	Apply	4
5.	List the steps to improve the accuracy of neural network data model.	Apply	4
6.	Explain fuzzy if then rule with example.	Apply	2
7.	Explain Tsukamoto fuzzy models	Apply	1
8.	Define fuzzy expert system. Discuss fuzzy decision making.	Apply	3
9.	Define aggregation rule. Explain how it works.	Apply	4
10.	Explain truth tables and truth values in fuzzy logic.	Apply	2

PART – C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT – IV FUZZY ARITHMETIC			
1.	Explain extension principle with example.	Apply	7
2.	What is the reason that logic function has rapidly become one of the most successful technology for developing sophisticated control systems?	Apply	9
3.	What is the artificial intelligence fuzzy logic?	Apply	4
4.	Can a fuzzy membership be True and False at the Same time?	Apply	5
5.	A perceptron with a unipolar step function has two inputs with weights $w_1 = 0.5$ and $w_2 = -0.2$, and a threshold $\theta = 0.3$ (θ can therefore be considered as a weight for an extra input which is always set to -1). For a given training example $x = [0, 1]^T$, the desired output is 1. Does the perceptron give the correct answer (that is, is the actual output the same as the desired output)?	Apply	3

PART – A (SHORT ANSWER QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT – V GENETIC ALGORITHMS			
1.	What two requirements should a problem satisfy in order to be suitable for solving it by a GA?	Remember	3, 4
2.	Define GA Based Machine Learning.	Understand	4
3.	List the various applications of GA.	Understand	3
4.	What is search space?	Remember	3
5.	Define operators of GA.	Remember	3
6.	Describe the parameters of GA.	Remember	4
7.	Draw the basic structure of GA.	Remember	4
8.	Define binary representation.	Remember	4
9.	Describe the population models.	Remember	3
10.	Give brief note on crossover operators.	Understand	3

PART – B (LONG ANSWER QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
UNIT – V GENETIC ALGORITHMS			
1.	Describe the various plots in R to visualize the data and explain the purpose of each plot in detail.	Apply	3
2.	Write R script to plot a data frame having: {df1: {red, green, blue, pink, black} df2: {3, 5, 8, 10, 34}} using relevant plot.	Apply	3
3.	List out the steps to plot the data models with relevant packages.	Apply	3
4.	How to partition the window to get more number of plots. Discuss on single and multi object plots in R.	Apply	4
5.	Discuss about the residuals with respect to observed values? State a case study to show the fitted line and residuals in logistic regression.	Apply	4
6.	Name and describe the main features of Genetic Algorithms (GA).	Apply	2
7.	How binary encoding can be done in crossover?	Apply	3
8.	What are genetic algorithms? Describe its advantages and disadvantages.	Apply	3
9.	Write a brief note on mutation. Discuss various operators used in mutation.	Apply	4
10.	Explain constrained optimization problems.	Apply	2

PART – C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
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UNIT – V
GENETIC ALGORITHMS

1.	Give an example of combinatorial problem. What is the most difficult in solving these problems?	Knowledge	5
2.	Consider the problem of finding the shortest route through several cities, such that each city is visited only once and in the end return to the starting city (the Travelling Salesman problem). Suppose that in order to solve this problem we use a genetic algorithm, in which genes represent links between pairs of cities. For example, a link between London and Paris is represented by a single gene 'LP'. Let also assume that the direction in which we travel is not important, so that LP=PL. a) How many genes will be used in a chromosome of each individual if the number of cities is 10? b) How many genes will be in the alphabet of the algorithm?	Apply	7
3.	A budget airline company operates 3 plains and employs 5 cabin crews. Only one crew can operate on any plain on a single day, and each crew cannot work for more than two days in a row. The company uses all planes every day. A Genetic Algorithm is used to work out the best combination of crews on any particular day. a) Suggest what chromosome could represent an individual in this algorithm? b) Suggest what could be the alphabet of this algorithm? What is its size? c) Suggest a fitness function for this problem. d) How many solutions are in this problem? Is it necessary to use Genetic Algorithms for solving it? What if the company operated more plains and employed more crews?	Apply	9

Prepared by:

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