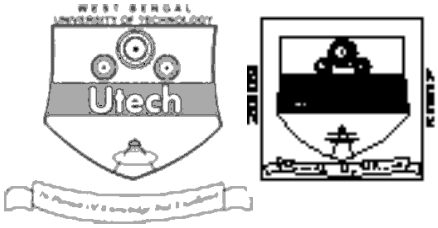
CS/B.TECH (CSE) (SUPPLE)/SEM-8/CS-801B/09
SOFT COMPUTING (SEMESTER - 8)



1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/B.TECH (CSE) (SUPPLE)/SEM-8/CS-801B/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JULY – 2009

SOFT COMPUTING (SEMESTER - 8)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

	Group – A										Group – B			Group – C			***Total Marks***	***Examiner's Signature***
Question Number																		
Marks Obtained																		

.....
Head-Examiner/Co-Ordinator/Scrutineer

S-53012 (28/07)

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CS/B.TECH (CSE) (SUPPLE)/SEM-8/CS-801B/09

SOFT COMPUTING

SEMESTER - 8

Time : 3 Hours] [Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) Let's assume that a fuzzy set A is defined as follows :

$$A = 0{\cdot}1/50 + 0{\cdot}3/60 + 0{\cdot}5/70 + 0{\cdot}8/80 + 1/90 + 1/100$$

What will be the value of $|A|$?

a) 3·7 b) 6

c) 1·7 d) none of these. ☐

ii) YAGER class is an example of which fuzzy complements ?

a) Continuous b) Involutive

c) Bothh (a) and (b) d) None of these. ☐

iii) Every fuzzy complement has at most

a) two equilibrium

b) three equilibrium

c) one equilibrium

d) none of these. ☐

iv) Let's assume that two fuzzy sets A & B are defined on Universe of Discourse $X = \{ x_1, x_2, x_3, x_4, x_5 \}$ as follows :

$$A = \{ (x_1, 0{\cdot}9), (x_2, 0{\cdot}3), (x_3, 0{\cdot}4), (x_4, 0), (x_5, 1) \}$$

$$B = \{ (x_1, 1), (x_2, 0{\cdot}5), (x_3, 0{\cdot}7), (x_4, 0), (x_5, 1) \}$$

If $A \Delta B$ is defined as $(A - B) \cup (B - A)$, then which of the following give the correct expression for $A \Delta B$?

a) $(x_1, 0{\cdot}1), (x_2, 0{\cdot}5), (x_3, 0{\cdot}6), (x_4, 0), (x_5, 0)$

b) $(x_1, 0{\cdot}1), (x_2, 0{\cdot}7), (x_3, 0{\cdot}6), (x_4, 1)$

c) $(x_2, 0{\cdot}5), (x_3, 0{\cdot}3), (x_4, 1)$

d) none of these. ☐

v) "Fittest will be survivor" is true for

a) Simulated annealing b) Tabu search

c) Genetic Algorithm d) ACO. ☐

vi) Random descent is true for

a) ACO b) Simulated annealing

c) Genetic Algorithm d) Tabu search. ☐

vii) Artificial neural network is based on the concept

a) gradient descent technique b) random descent technique

c) biological neuron d) (a) and (c). ☐

viii) Kohonen network / adaptive resonance theory model is

a) purely unsupervised b) supervised

c) reinforcement d) none of these. ☐

ix) Classification of XOR input pattern is

a) separable by perceptron model

b) separable by Kohonen model

c) separable by multilayer feed back network

d) all of these.

x) In ANN model

a) learning constant should be small

b) should be constant through out the epoch

c) should be 'one'

d) should be small but adaptive and remain stable to irrelevant input.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What do you mean by Fuzzy logic ? How is it different from classical logic ? Explain with suitable example. 2 + 3

3. What are the roles of α-cuts and strong α-cuts in fuzzy set theory ? What is the difference between them ? Give an example. 3 + 2

4. What is soft computing ? Characterize the heuristics approach. What is Meta heuristic ? 2 + 2 + 1

5. Critically comment on 'gradient descent technique may be stuck at local optima' and 'simulated annealing is random descent approach'. 3 + 2

6. Map the biological neuron to McCulloch mathematical neuron component-by-component. 5

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) "The membership grade of an element $x \in X$ in fuzzy set A is not a probability." Justify this statement.

   b) State resolution principle & then prove it.

   c) Let's assume $A_i \in F(X)\ \forall_i \in I$, where I is an index set and $F(X)$ denotes the set of all fuzzy sub-sets defined on X. Now prove that

   i) $\bigcup_{i \in I} \alpha + A_i = \alpha + \left(\underset{\cdot}{A_i} \right)$

   ii) $\bigcap_{i \in I} \alpha + A_i \subseteq \alpha + \left(\underset{\cdot}{A_i} \right)$

   d) Define cut-worthy and strong cut-worthy property of a fuzzy set. Prove that set inclusion property is both cut-worthy and strong cut-worthy.

   $1 + (1 + 3) + (2 + 2) + (2 + (2 + 2))$

8. a) Let's suppose two fuzzy sets A and B are defined as follows :

   $A = \{(3, 0{\cdot}5), (5, 1), (7, 0{\cdot}6)\}$, $B = \{(3, 1), (5, 0{\cdot}6)\}$

   Now find $A \times B$, $A + B$, $A \,.\, B$, $A \oplus B$.

   b) What do you mean by decomposition of a fuzzy set A ? Prove that for any $A \in F(X)$,

   $A = \bigcup_{\alpha \in \lambda(A)} \alpha^A$ where $\lambda(A)$ is the level set of A.

   c) What is axiomatic skeleton for fuzzy complements ? Let's assume that a given fuzzy complement c has a unique equilibrium e_c . Then prove that

   $a \le c(a)$ iff $a \le e_c$ and $a \ge c(a)$ iff $a \ge e_c$.

   d) If c is a continuous fuzzy complement, then prove that c has a unique equilibrium. $2 + (1 + 3) + (2 + 4) + 3$

9. a) Describe the Genetic algorithm with some important operations with some example.

   b) Critically comment "steady state selection implies elitism". 10 + 5

10. a) What is the deficiency of perceptron model ? Solve XOR classification problem using multiplayer neural network.

    b) Critically comment, "Delta learning rule is better than perceptron learning rule."

    c) What is stability-plasticity dilemma ? 8 + 4 + 3

11. a) Describe Kohonen Unsupervised network in brief.

    b) What are the different types of ANN with respect to learning ?

    c) Consider the four input (including thresold), single node perceptron with a bipolar sigmoid function.

    $a\ (\ net\ ) = \{\ 2/(\ 1 + exp\ (-net\ )\ )\ \} - 1$ where λ is taken 1 and set of input and desired output training as follows :

    $\{ X\ (\ 1\ ) = (\ 1,\ -2,\ 0,\ -1\ )^{T}\ ,\ d\ (\ 1\ ) = -1\ \}$,

    $\{ X\ (\ 2\ ) = (\ 0,\ 1{\cdot}5,\ -0{\cdot}5,\ -1\ )^{T}\ ,\ d\ (\ 1\ ) = -1\ \}$,

    $\{ X\ (\ 3\ ) = (\ -1,\ 1,\ 0{\cdot}5,\ -1\ )^{T}\ ,\ d\ (\ 1\ ) = 1\ \}$.

    Initial weights are taken $W\ (\ 1\ ) = [\ 1,\ -1,\ 0,\ 0{\cdot}5\ ]^{T}$ and $\eta = 0{\cdot}1$.

    Apply delta-learning rule and estimate the weights up to first epoch. 5 + 5 + 5

12. Write short notes on any *three* of the following : 3 × 5

    a) Hopfield Memory

    b) Simulated Annealing

    c) Ant Colony optimization

    d) Linguistic hedge.

END