



Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech (CSE)/SEM-1/CST-1103A4/2011-12

2011

SOFT COMPUTING

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

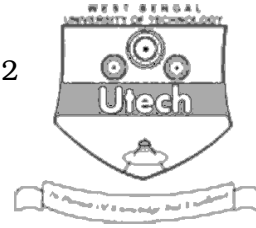
1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) Fuzzy IF-THEN rule is a kind of

- a) Expert knowledge
- b) Supervised knowledge
- c) Unsupervised knowledge
- d) None of these.

ii) $\mu_A(x)$ is a membership function whose value is within the range

- | | |
|-------------|----------------|
| a) [0, 1] | b) [- 1, 1] |
| c) [1, 2] | d) [- 1, 1]. |



- iii) $a \wedge b = \min (a, b)$ is an example of
- a) Monotonicity
 - b) Intersection
 - c) Negation
 - d) Associative.
- iv) Which statement is true ?
- a) $PL (A) \geq Bel (A) > m (A)$
 - b) $PL (A) \geq Bel (A) \geq m (A)$
 - c) $PL (A) \leq Bel (A) \leq m (A)$
 - d) $Bel (A) \leq PL (A) \leq m (A)$.
- v) Linguistic variables are always
- a) Fuzzy
 - b) Crisp
 - c) Non-negative
 - d) None of these.
- vi) MILORD is a
- a) Fuzzy expert system
 - b) Neural expert system
 - c) Fuzzy Neural system
 - d) None of these.
- vii) $\mu_{C_l}(w) = \alpha_i \mu_{C_i}(w)$ is a rule given by
- a) Mamdani
 - b) Sugeno
 - c) Zadeh
 - d) Takaki.



- viii) Adaline is always
- a) single linear unit
 - b) multiple linear unit
 - c) cross linear unit
 - d) none of these.
- ix) Back propagation is a
- a) learning algorithm
 - b) adaptive learning algorithm
 - c) simple learning algorithm
 - d) none of these.
- x) Pixel is a
- a) picture element
 - b) image element
 - c) both (a) & (b)
 - d) none of these.
- xi) Acquisition of image is a part of
- a) image segmentation
 - b) image restoration
 - c) image enhancement
 - d) all of these.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

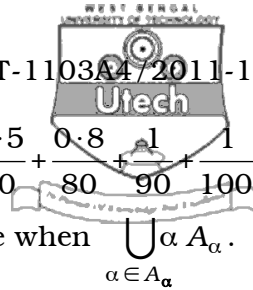
2. Write down the comparative study of classical crisp set & fuzzy crisp set. Draw its characteristic function.
3. Let A be a fuzzy set in U . Then the membership function of A can be expressed in terms of the characteristic function of its α cuts according to

$$\mu_A(x) = \sup_{\alpha \in [0, 1]} [\alpha \wedge \mu_{A_\alpha}(x)]$$

$$\forall x \in U_x.$$

Where \wedge denotes minimal operation and μ_{A_α} is the characteristic function of the crisp

$$\text{set } A_\alpha(\alpha\text{-cut}) = \begin{cases} 0, & \text{otherwise} \\ 1 & \text{iff } x \in A_\alpha \end{cases}.$$



4. Consider a fuzzy set $A = \frac{0.1}{50} + \frac{0.3}{60} + \frac{0.5}{70} + \frac{0.8}{80} + \frac{1}{90} + \frac{1}{100}$. Calculate all the α -cuts within the universe when $\bigcup_{\alpha \in A_{\alpha}}$.

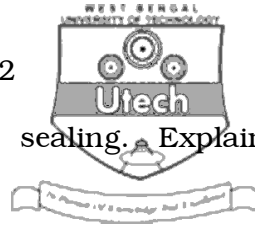
5. Discuss belief & plausibility with proper example. Write its measures in the term of fuzzy relation.
6. Write down the usefulness of fuzzifier & defuzzifier. What is fuzzy clustering ?

GROUP – C

(Long Answer Type Questions)

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

7. Write step function, hard limiter, unipolar sigmoidal & bipolar sigmoidal functions with proper graph representation. State Hebbian learning rule for ANN. What is perceptron learning rule ? Describe Adaline in brief. $7 + 3 + 3 + 2$
8. Describe Back-propagation learning algorithm. Write algorithm of back-propagation rule. $8 + 7$



9. What is mutation ? Describe fitness scaling. Explain multipoint crossover with proper example.

Having $X = \{ p, q, r, s \}$ & $B = P(n)$ the focal elements of $M(\cdot)$, $Bel(\cdot)$ $Pl(\cdot)$ is given as

elements	$m(\cdot)$	$Bel(\cdot)$	$Pl(\cdot)$
$\{p\}$	0	0	0.6
$\{q\}$	0.15	0.15	1
$\{r\}$	0	0	0.7
$\{s\}$	0	0	0.85
$\{Pq\}$	0	0.15	1
$\{Pr\}$	0	0	0.7
$\{Ps\}$	0	0	0.85
$\{qr\}$	0	0.15	1
$\{qs\}$	0.15	0.3	1
$\{rs\}$	0	0	0.85
$\{pqr\}$	0	0.15	1
$\{pqs\}$	0	0.3	1
$\{qrs\}$	0.1	0.4	1
$\{prs\}$	0	0	0.85
$\{qqrs\}$	0.6	0	1

Calculate $Bel(q)$, $Bel(qs)$, $Pl(pq)$, $Pl(prs)$. $2 + 4 + 3 + 6$



10. What is image segmentation ? Write down the basic steps of digital image processing. What are grey scale & grey value ? Describe CMYK colour model. How grey level intensity values are related with fuzzy values ? 2 + 4 + 4 + 4 + 1

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

- a) Fuzzy partial ordering
- b) Genetic algorithm — basic steps
- c) Zadeh's extension principle
- d) Linguistic variables with example
- e) Supervised, unsupervised & reinforcement learning.
- f) Verification of the following set to satisfy De'Morgan's law $\mu_A(x) = \frac{1}{1+2x}$.

=====