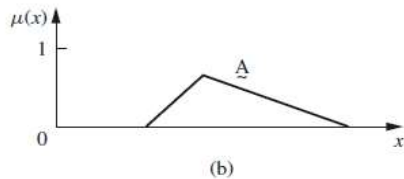
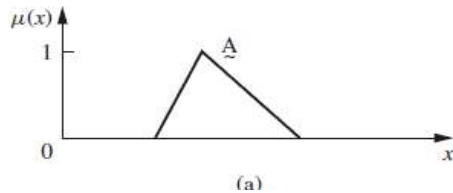


- (iv) The region of universe that is characterized by complete membership in the set is called
 (a) Core (b) Support
 (c) Boundary (d) Fuzzy.
- (v) Linearly separable problems are interesting, because of the fact that
 (a) clustering can be done very easily.
 (b) numbers of hidden layers are optimized.
 (c) they are the only mathematical functions that you can draw.
 (d) both (a) and (b).
- (vi) A fuzzy set has a membership function whose membership values are strictly monotonically increasing or strictly monotonically decreasing or strictly monotonically increasing then strictly monotonically decreasing with increasing values for elements in the universe is called
 (a) convex fuzzy set (b) concave fuzzy set
 (c) non concave fuzzy set (d) non convex fuzzy set.
- (vii) Ability to learn how to do tasks based on the data given for training or initial experience is called
 (a) self organization (b) fault tolerance
 (c) adaptive learning (d) robustness.
- (viii) The height $h(A)$ of a fuzzy set A is defined as $h(A) = \sup A(x)$ where x belongs to A . Then the fuzzy set A is called normal when
 (a) $h(A)=0$ (b) $h(A)<0$ (c) $h(A)=1$ (d) $h(A)<1$.
- (ix) Match the Column

List I



List II

1 Subnormal Fuzzy Set

2 Normal Fuzzy Set

7. (a) Assume a simple classification problem by perceptron rule, input space is one dimensional
 Class I $x_1 = 0.5$ $x_2 = 2$ $d(1) = d(3) = +1$
 Class II $x_3 = 0.5$ $x_4 = -2$ $d(2) = d(4) = -1$
 Assume $\eta = 0.5$ suppose initial weights are $w = [-2, 1.5]^T$. Calculate the final weights after two epochs.
- (b) Consider Linear Associative memory with three input $A_1 = [-1, A_2 = [1, 1, 1, -1]$, $A_3 = [-1, -1, -1, 1]$, Now create weight vector and identify the noise for input vector $[1, 2, 3, 4]$.

6 + 6

Group - E

8. (a) Compare and contrast between classical logic and fuzzy logic.
 (b) Describe how the neural network is used to obtain membership functions.
 (c) The two fuzzy vectors of length 4 are defined as
 $a = (0.5, 0.2, 1.0, 0.8)$
 $b = (0.8, 0.1, 0.9, 0.3)$
 Find the inner product and outer product of these two fuzzy vectors.
9. (a) Explain the features of membership functions.
 (b) Show the λ -cut relation of a fuzzy equivalent relation result crisp equivalence relation.
 (c) Explain Rough set membership and Rough dependency attributes.

3 + 4 +

3 + 4 +

Time Allotted : 3 hrs

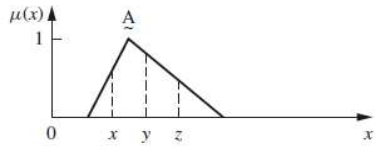
Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group. Candidates are required to give answer in their own words as far as practicable.

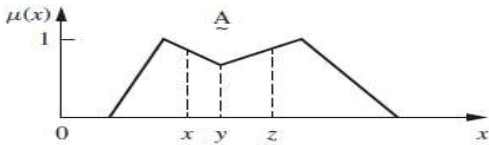
Group - A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) 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:
(a) 238 (b) 76 (c) 119 (d) 184.
- (ii) If crossover between chromosomes in search space does not produce significantly different offspring, which of the following statement(s) is/are true? (if offspring consist of one half of each parent)
(i) The crossover operation is not successful.
(ii) Solution is about to be reached.
(iii) Diversity is so poor that the parents involved in the crossover operation are similar.
(iv) The search space of the problem is not ideal for GAs to operate.
(a) ii, iii & iv only (b) ii & iii only
(c) i, iii & iv only (d) all of the above.
- (iii) Which of the following is true?
(i) On an average, neural networks have higher computation rates than conventional computers.
(ii) Neural networks learn by example
(iii) Neural networks mimic the way the human brain works
(a) All of them are true (b) (ii) and (iii) are true
(c) (i) and (ii) are true (d) None of these.



(c)

3 Non Convex Normal Fuzzy Set



(d)

4 Convex Normal Fuzzy Set

- (a) a b c d
1 2 3 4
(c) a b c d
3 2 1 4

- (b) a b c d
4 3 2 1
(d) a b c d
2 1 4 3

- (x) Which algorithm does not belong to Heuristic technique?
(a) Simulated annealing (b) Ant Colony Optimization
(c) Genetic algorithm (d) Bee Colony Optimization.

Group - B

2. (a) Describe the GA based ANN system and explain the function of Genetic algorithm in that neural network.
(b) What are the different types of learning in computer system? Explain them all.

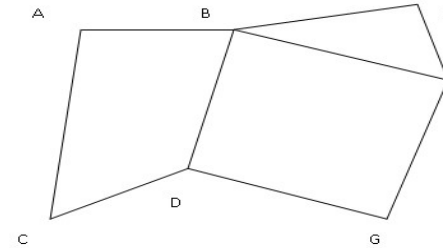
6 + 6 = 12

3. (a) Define Hard computing in terms of Global Optima.
(b) Define Soft Computing in terms of "Intractability".
(c) Critically comment on this statement "Shortest path may not lead to a quality solution for all time".
(d) A, B, C, D, E, F, G and H are the nodes of a complete graph. Suppose you have the problem of Graph Colouring. What will be the minimum number of colour to colour all the nodes. What is computational complexity of Graph colouring?

3 + 3 + 3 + (2 + 1) = 12

Group - C

4. (a) Draw a Flow chat for Genetic Algorithm.
(b) Suppose we have a problem of TSP with 7 nodes. Now The gr symmetric and has the weights AB=EG=BF=6, AC=8, BD=7, GD=8, AC=BE=7.5. Now formulate the string, fitness value, over and mutation



4 + 1

5. (a) Define Pareto-Model in terms of Multiple Objective Optimi: Problem with some suitable example.
(b) Given bellow a table for flight information. We have to optimis as well as cost.
Now evaluate the Non-dominated set.

Flight	Travel Time (HR)	Price (\$)
A	10	1700
B	9	2000
C	8	1800
D	7.5	2300
E	6	2200

6 + 1

Group - D

6. (a) What is associative memory?
(b) Differentiate between linear associative memory and l associative memory.
(c) Consider a BAM memory.
X1 = {2, 3, 6, -1}, X2 = {1, 2, -7, -1}, X3 = {-2, 3, -6, -1}
Y1 = {1, 2, -1}, Y2 = {2, -1, -1}, Y3 = {6, -1, -1}
Create weight matrix W.

2 + 4 + 1