Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(IT)/SEM-7/IT-703C/2012-13

2012

SOFT COMPUTING

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

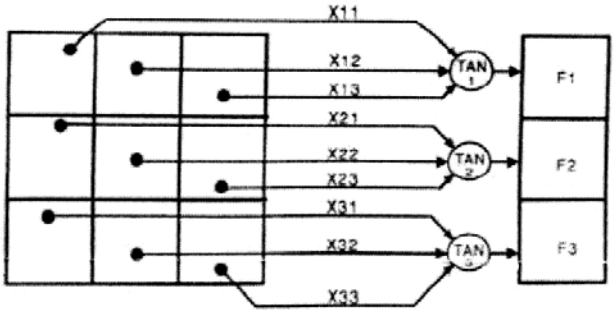
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

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

i) The network in figure given below is



a) a single layer feed-forward neural network

b) an autoassociative neural network

c) a multiple layer neural network

d) none of these.

ii) A 3-input neuron is trained to output a zero when the input is 110 and a one when the input is 111. After generalisation, the output will be zero when and only when the input is

a) 000 or 110 or 011 or 101

b) 010 or 100 or 110 or 101

c) 000 or 010 or 110 or 100

d) 111 or 010 or 000 or 001.

iii) 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) 150.

iv) Which of the following are true ?

i) On average, neural networks have higher computational rates than conventional computers

ii) Neural networks learn by example

iii) Neural networks mimic the way the human brain works.

a) (i) and (iii) b) (ii) and (iii)

c) (i), (ii) and (iii) d) None of these.

v) Which of the following is/are true for neural networks ?

i) The training time depends on the size of the network

ii) Neural networks can be simulated on a conventional computer

iii) Artificial neurons are identical in operation to biological ones.

a) (ii) only b) (i) and (ii)

c) All of these d) None of these.

vi) What are the advantages of neural networks over conventional computers ?

i) They have the ability to learn by example

ii) They are more fault tolerant

iii) They are more suited for real time operation due to their high 'computational' rates.

a) (i) and (ii) b) (i) and (iii)

c) All of these d) None of these.

vii) Which of the following is/are true ?

Single layer associative neural networks do not have the ability to

i) perform pattern recognition

ii) find the parity of a picture

iii) determine whether two or more shapes in a picture are connected or not.

a) (ii) and (iii) b) (ii) only

c) All of these d) None of these.

viii) An autoassociative network is

a) a neural network that contains no loops

b) a neural network that contains feedback

c) a neural network that has only one loop

d) a neural network that has selective loops.

ix) A perceptron is

a) a single layer feed-forward neural network with preprocessing

b) an autoassociative neural network

c) a double layer autoassociative neural network

d) all of these.

x) Artificial neural networks are inspired by

a) high speed parallel processors

b) human brain

c) swarm intelligence

d) all of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following $3 \times 5 = 15$

2. If A and B are two fuzzy sets

$A = \frac{0}{0} + \frac{0 \cdot 2}{1} + \frac{0 \cdot 4}{2} + \frac{0 \cdot 5}{3} + \frac{0 \cdot 8}{4} + \frac{1}{5}$ and

$B = \frac{0}{0} + \frac{0 \cdot 6}{1} + \frac{0 \cdot 4}{2} + \frac{0 \cdot 2}{3} + \frac{0 \cdot 6}{4} + \frac{0 \cdot 5}{5}$. Find the Algebraic Sum and Bounded Sum. 2½ + 2½

3. If A and B are two fuzzy sets

$A = \frac{0}{0} + \frac{0 \cdot 2}{1} + \frac{0 \cdot 4}{2} + \frac{0 \cdot 5}{3} + \frac{0 \cdot 8}{4} + \frac{1}{5}$ and

$B = \frac{0}{0} + \frac{0 \cdot 6}{1} + \frac{0 \cdot 4}{2} + \frac{0 \cdot 2}{3} + \frac{0 \cdot 6}{4} + \frac{0 \cdot 5}{5}$. Verify the De Morgan's law with the above example.

4. What are meant by supervised, reinforcement and unsupervised learning rules ?

5. Define Pattern Clustering and Classification. 2½ + 2½

6. What do you mean by Schema ? What are order and length of Schema ? 1 + 2 + 2

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What is the difference between centroid method and centre for largest area method of defuzzification ?

   b) Explain with example how a fuzzy relation is converted into crisp relation using λ-cut process ?

   c) Show that λ-cut relation of the

$$R = \begin{bmatrix} 1 & 0 \cdot 8 & 0 \cdot 4 & 0 \cdot 5 & 0 \cdot 8 \\ 0 \cdot 8 & 1 & 0 \cdot 4 & 0 \cdot 5 & 0 \cdot 9 \\ 0 \cdot 4 & 0 \cdot 4 & 1 & 0 \cdot 4 & 0 \cdot 4 \\ 0 \cdot 5 & 0 \cdot 5 & 0 \cdot 4 & 1 & 0 \cdot 5 \\ 0 \cdot 8 & 0 \cdot 9 & 0 \cdot 4 & 0 \cdot 5 & 1 \end{bmatrix}$$

5 + 5 + 5

8. a) Explain the cycle of Genetic algorithm.

   b) What are the cross-over rate and mutation rate ?

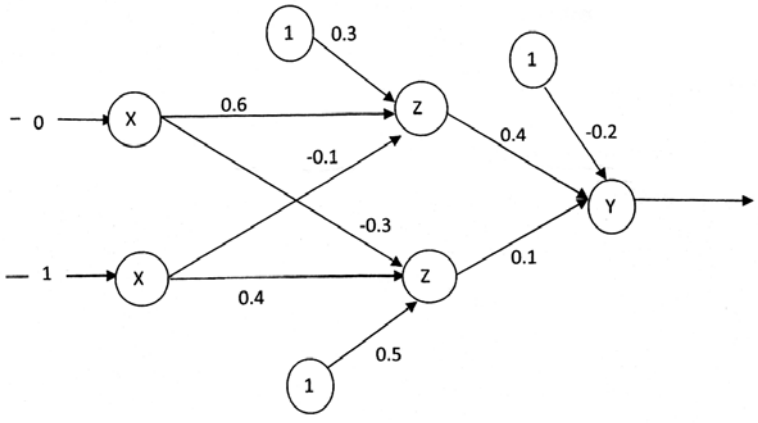
   c) Solve the following travelling salesman problem for 6 cities by using genetic algorithm :

City	1	2	3	4	5	6
1	0					
2	5	0				
3	6	13	0			
4	8	8	9	0		
5	6	7	8	5	0	
6	9	5	8	7	9	0

4 + (2 + 2) + 7

9. a) Explain Back propagation algorithm.

   b) Using back propagation network, find the new weights for the nets shown in the figure using a learning rate $\alpha = 0 \cdot 25$ and binary sigmoidal activation function :



7 + 8

10. a) What is pattern ?

    b) Explain *k*-means algorithm.

    c) Cluster the following eight points [with (*x*, *y*) representing locations] into three clusters $A_1(2,10)$, $A_2(2,5)$, $A_3(8,4)$, $A_4(5,8)$, $A_5(7,5)$, $A_6(6,4)$, $A_7(1,2)$, $A_8(4,9)$. Initial cluster centres are $A_1(2,10)$, $A_4(5,8)$ and $A_5(7,5)$. The distance function between two points $a=(x_1,y_1)$ and $b=(x_2,y_2)$ is defined as $d(x,y)=| x_2-x_1+| y_2-y_1 \|$. Use *k*-means algorithm to find three different cluster centres after second iteration. 2 + 5 + 8

11. a) What is genetic algorithm ? How is genetic algorithm different from traditional algorithm ?

    b) State the schema theorem.

    c) Discuss the different types of crossover method in genetic algorithm.

    d) Explain different types of selection strategies used in GA.

    e) Mention two applications of Genetic algorithm in real life. (1 + 3) + 2 + 4 + 3 + 2

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