Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

FIRST SEMESTER M.TECH (CONTROL SYSTEMS)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: SOFT COMPUTING TECHNIQUE [ICE-325]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A. What are the fundamental building blocks of the biological neural network? Discuss. **02**

1B. Tabulate any six differences between the biological and artificial neural network. **03**

1C. Implement the perceptron rule for the set of input training vectors x_1= $[0\ -2\ 0\ \ -1]^t$; x_2=$[0\ 1.5\ -0.5\ -1]^t$; x_3=$[-1\ 1\ 0.5\ -1]^t$ and the initial weight vector w^1 is assumed as $[1\ -1\ 0\ 0.5]^t$. The learning constant is assumed to be c=0.1. The desired response for x_1, x_2 and x_3 are d_1= -1, d_2= -1and d_3= 1. Find the final weights using perceptron learning rule. **05**

2A. Write the expressions for the binary sigmoidal and bipolar sigmoidal activation functions. **02**

2B. Using the Heb Net for the AND function with bipolar inputs and target achieve the line of separability. **03**

2C. Explain the architecture of the MADALINE network and write its step wise algorithm. **05**

3A. Write a short note on Adaptive Resonance Theory (ART) with its sketch. **02**

3B. Design a Hopfield network for 4 bit bipolar patterns. The training patterns are S1=[1 1 -1 -1]; S2=[-1 1 -1 1]; S3=[-1 -1 -1 1]. Find the final weight matrix and the energy for the three input samples. Determine the pattern to which the sample S=[-1 1 -1 -1] associates. **03**

3C. Apply the Mexican Hat algorithm for the simple net having seven units with the following specifications. $f(x)=\begin{cases}0 & if\ x<0\\ x & if\ 0\le x\le 2\\ 2 & if\ 2<x\end{cases}$. The initial parameters are given by **05**

R_1=1, R_2=2, C_1=0.5, C_2=-0.3. Find the unit which is having higher activation function.

4A. What is membership function? **02**

4B. Let X be the universe of military aircraft of interest as defined here **03**

$X = a10, b52, b117, c5, c130, fu, flu, f14, f15, f16, f111, Kc130$.

Also let A be the fuzzy set of bomber aircraft $A = \left\{ \frac{0.2}{f16} + \frac{0.4}{f4} + \frac{0.5}{a10} + \frac{0.5}{f14} + \frac{0.6}{f15} + \frac{0.8}{f111} + \frac{1.0}{b117} + \frac{1.0}{b52} \right\}$ and B is the fuzzy set of fighter aircraft given by $B = \left\{ \frac{0.1}{b117} + \frac{0.3}{f111} + \frac{0.5}{f4} + \frac{0.8}{f15} + \frac{0.9}{f14} + \frac{1.0}{f16} \right\}$.

Find (i) A/B (ii) $\overline{A}$ (v) $\overline{B}$ (iii) $\overline{AUB}$ (iv) $\overline{A \cap B}$ (v) B/A (vi) $\overline{A}$ UA.

4C. Brief about linguistic hedges. Also explain any four linguistic hedges with an expression and its numerical example. **05**

5A. Define control surface. **02**

5B. Briefly explain the swarm optimization technique with its architecture. **03**

5C. Fig.5.C shows the three survey data. Aggregate these three survey results to find the single most nearly reprehensive right of way width (z) to allow the rail road to make its initial estimate of the right of way purchasing cost. Using the equations of centroid method and the preceding three fuzzy sets, find z*. Take y=μ and X=Z. **05**

6A. Write the need for Genetic Algorithms in Engineering systems. **02**

6B. Write a short note on Genetic Algorithm and Fuzzy systems. **03**

6C. Suppose that we decided to change our setpoint level from 5 feet to 8 feet in the single tank system. The error is defined as the setpoint level, 8 feet, minus the current level, 5 feet, or + 3 feet. The three rules are fired, producing the following results: **05**

(i) Positive error is 0.5 (ii) Zero error is 0.5. (iii) Negative error is 0.0, for the input and output membership function diagrams and comment with respect to the given results.

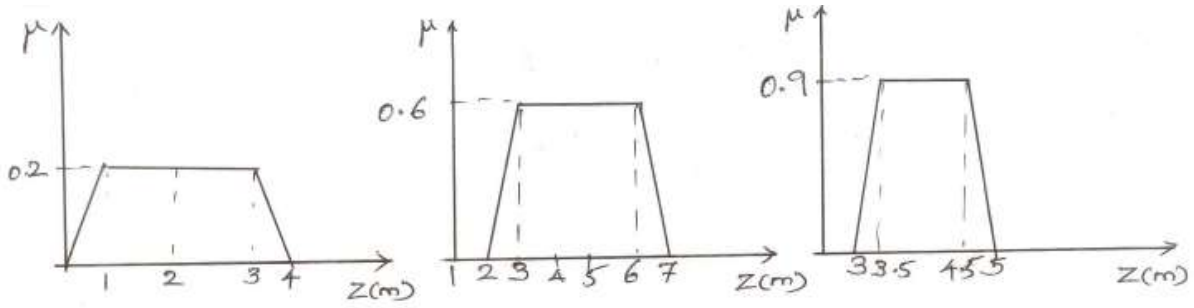

Fig.5.C