Name : ……………………………………………………….

Roll No. : ……………………………………………………..

Invigilator's Signature : …………………………………….

CS/M.TECH (IE&M)/SEM-2/IEM-204C/2010
2010
SYSTEMS ANALYSIS TECHNIQUE

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.

Answer any *five* questions.   5 × 14 = 70

1. What is soft computing ? What are the principal constituents of soft computing ? Briefly explain fuzzy logic. What are the main differences between a crisp set and a fuzzy set ?

                                                              3 + 3 + 4 + 4

2. Define membership functions. What is fuzzy subset ? Fuzzy subsets OLD and TALL are defined by the following membership functions :

    Old (x) = 0, if age (x) < 25 years

                = (age (x) – 25 years) / 35 years, if 25 years <=

                                                        age (x) <= 60 years

                = 1, if age (x) > 60 years ;

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TALL (y) = 0, if height (y) < 5 ft

= (height (y) – 5 ft)/1·5 ft, if 5 ft <=

height (y) <= 6·5 ft

= 1, if height (y) > 6·5 ft.

Age and height of 6 persons are given as follows :

Age (x) :	65	30	27	32	31	04
Height (y) :	$3^{'} 2^{''}$	$5^{'} 5^{''}$	$5^{'} 9^{''}$	$5^{'} 11^{''}$	$6^{'} 2^{''}$	$3^{'} 5^{''}$

Compute the membership functions correponding to (i) X is OLD, (ii) Y is TALL, (iii) X is OLD and Y is TALL, and (iv) Y is not TALL. 4 + 3 + 7

3. Briefly define a genetic algorithm. How is it different from traditional optimization and search techniques ? Draw the flowchart of a genetic algorithm. What is generation number ? How can it effect the solution quality in a genetic algorithm ? 3 + 4 + 4 + 2 + 1

4. Write down the working principles of a genetic algorithm. What are crossover and mutation operations in a genetic algorithm ? Explain single-point crossover operation with a simple example. What is bit-by-bit mutation ? 4 + 4 + 4 + 2

5. Compare and contrast biological neuron and artificial neuron. List the commonly used activation functions. What is the impact of weight in an ANN ? Define bias and threshold. Define overfitting and overtraining.

4 + 2 + 2 + 4 + 2

6. Define linear separability. Justify XOR function is non-linearly separable by a single decision boundary line. In what ways is bipolar representation better than binary representation ? Obtain the output of the neuron *Y* for the network shown in the figure using activation function as
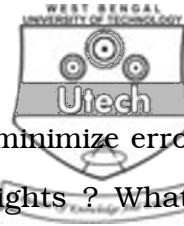
   a) binary sigmoidal

   b) bipolar sigmoidal.   2 + 4 + 2 + 6

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7. State the significance of error portion δ_k and δ_j in Back Propagation Algorithm. What is meant by local minima and global minima ? Derive generalized delta learning rule. Implement NOR function using perceptron network for bipolar inputs and targets.   3 + 3 + 3 + 5

8. Why is gradient descent method adopted to minimize error ? What are the methods of initializing the weights ? What is the necessity of momentum factor in weight updation process ? How many hidden layers can there be in a neural network ? Explain the training algorithm of radial basis function network. 3 + 2 + 2 + 2 + 5

9. Write notes on any *two* of the following : 2 × 7

   a) Analytic Hierarchy Process

   b) Data Envelopment Analysis

   c) Self Organising Map

   d) Schema — Theorem.