CLASS: BE   SEMESTER : V
BRANCH: IT   SESSION : MO/18
                           SUBJECT: IT5025-PRINCIPLES OF SOFT COMPUTING
TIME: 03:00 HRS.   FULL MARKS: 60

INSTRUCTIONS:
1. **The question paper contains 7 questions each of 12 marks and total 84 marks.**
2. **Candidates may attempt any 5 questions maximum of 60 marks.**
3. **The missing data, if any, may be assumed suitably.**
4. **Before attempting the question paper, be sure that you have got the correct question paper.**
5. **Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.**

Q.1(a) Define a symmetric fuzzy set.   [2]
  (b)   How will you illustrate the triangular membership function with three parameters (i, j, k) with suitable   [4]
        diagram?
  (c)   Why cylindrical extension is used in fuzzy set give mathematical expression? Define mathematically   [6]
        the operation used to reduce the dimension of a membership function.

Q.2(a) State the generalized parameters used to represent a linguistic variable.   [2]
  (b)   Consider the universe of discourse U= {1, 2, 3, 4, 5}. The primary linguistic terms are 'True' and   [4]
        'False' which is mapped onto U. The fuzzy set for True is given as {(1,1), (0.8, 2), (0.6, 3), (0.4, 4),
        (0.2, 5)}. Find the linguistic modified fuzzy sets for (i) Not Very True (ii) Not Very True and Not Very
        Very False (iii) Intensively True
  (c)   The universe of discourse for the rate of 'rain fall' is X= {a, b, c, d} and 'drought level' is Y= {a, b, c}. [6]
        Let High (rain fall)= {0.5/b + 0.8/c + 1/d} and Low(drought level) = {1/a + 0.6/b + 0.2/c}. The rule
        "IF rain fall is High then drought is Low" is given. Applying the knowledge of Mamdani Max-Min
        composition deduce the drought level when rain fall is 'Very High'.

Q.3(a) Mention the necessity of defuzzification process.   [2]
  (b)   For the given rule "IF 3=x AND 5=y THEN z =ax + by + c ", which fuzzy inference system will you   [4]
        implement, justify your answer. Also state the advantages of the model.
  (c)   Design a fuzzy Air Conditioner Control system with a set of membership functions which consists of a   [6]
        dial to control the flow of air(warm/cool) and a thermometer to measure the temperature(T). When
        the dial is turned positive, warm air is supplied and if it is turned negative, cooled air is supplied; if
        it is at 0 then no air is supplied. ΔT is the difference between the room temperature and desired
        temperature. Also deduce at least three rule base to design the system.

Q.4(a) What will be the impact of crossover probability on the population in Genetic Algorithms?   [2]
  (b)   Mention how conventional optimization techniques differ from Genetic Algorithms.   [4]
  (c)   Design the flowchart to represent the working of simple genetic algorithms. Implement uniform   [6]
        crossover with mask technique(consider any random string as mask) on the following binary strings to
        generate two offsprings.
        A $\rightarrow$ 0110100101 B $\rightarrow$ 0100110010

Q.5(a) Contrast and compare supervised and unsupervised learning method with suitable example.   [2]
  (b)   Discuss mathematical concept of linear separability to classify patterns based on their output   [4]
        responses.
  (c)   Use perceptron learning model to compute the weights for logical ANDNOT function for bipolar two   [6]
        input variables. Consider rate of learning as 0.5. Show your results for a single epoch.

Q.6(a) What is the basic difference between the perceptron learning rule and delta rule?   [2]
  (b)   How the choice of the learning factors like initial weights, learning rate, momentum factor and   [4]
        number of hidden nodes influence Back Propagation Neural Network?
  (c)   Mathematically describe the concept of computing the error correction terms and weight updation   [6]
        phase in the Back Propagation Neural Network model consisting of a single hidden layer. (Assume that
        your model consists of 6 input neurons, 3 hidden neurons and 2 output neurons).

Q.7(a) What do you mean by competitive learning network?   [2]
  (b)   Discuss briefly the important features of Kohonen Self organizing maps.   [4]
  (c)   Apply Hebbian learning rule to find the weights required to classify the given input patterns. The   [6]
        input values are 1 for '+' symbol and -1 for '-' symbol. Input pattern L (+ - - + - - + + + +) belongs to
        the class 1 and U (+ - + + - + + + + +) belongs to the class -1. Also represent the sketch of the network.