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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Fifth Semester B.Tech Degree (S,FE) Examination January 2022 (2015 Scheme)

Course Code: CS361
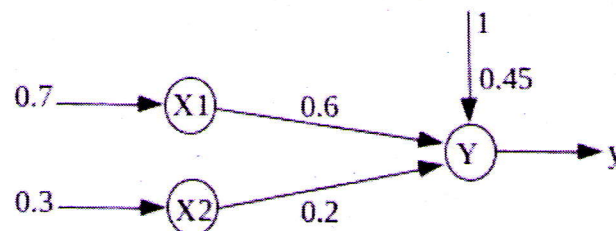### Course Name: SOFT COMPUTING

Max. Marks: 100   Duration: 3 Hours

PART A
Answer all questions, each carries 3 marks.   Marks

1   Explain any three basic connection architectures of neural networks.   (3)

2   Calculate the net input to the neuron Y for the network shown in figure.   (3)
Compute output of the neuron Y using binary sigmoidal activation function.

3   Write perceptron training rule. Explain the terms involved in it.   (3)

4   Explain any three learning factors of back propagation network.   (3)

PART B
Answer any two full questions, each carries 9 marks.

5   a)   Design a McCulloch–Pitts neuron to implement AND function. Use binary data.   (6)

    b)   Explain the training algorithm of Hebb network.   (3)

6   a)   What are the different types of learning methods employed in neural networks?   (4)

    b)   How is error propagated in backpropagation network? Explain the phase II of BPN training algorithm.   (5)

7   a)   Explain the architecture of Adaline network.   (3)

    b)   Implement OR function using Adaline network. Use bipolar inputs. Perform one epoch of training.   (6)

PART C
Answer all questions, each carries 3 marks.

8   Explain the concept of set membership in fuzzy logic. Illustrate using an example.   (3)

9   Explain any three fuzzy set operations along with their membership calculation   (3)
       methods.

10   What are the three basic features involved in characterizing a membership   (3)
       function? Explain.

11   Define λ – cut set of a fuzzy set. Compute λ – cut set for $\lambda = .6$ of the fuzzy set   (3)
       A:

$$A = \left\{ \frac{1}{a} + \frac{0.9}{b} + \frac{0.6}{c} + \frac{0.3}{d} + \frac{0.01}{e} + \frac{0}{f} \right\}$$

PART D

Answer any two full questions, each carries 9 marks.

12   Define composition operation in fuzzy relations? Two fuzzy relations R and S   (9)
       are given below. Obtain the composition T of these fuzzy relations using
       i)Max-min composition
   ii)Max-product composition

$$R = \begin{array}{c} \\ x1 \\ x2 \end{array} \begin{array}{cc} y1 & y2 \\ \left[\begin{array}{cc} .5 & .2 \\ .3 & .8 \end{array} \right] \end{array} \qquad S = \begin{array}{c} \\ y1 \\ y2 \end{array} \begin{array}{ccc} z1 & z2 & z3 \\ \left[\begin{array}{ccc} 1 & .5 & .2 \\ .8 & .4 & .6 \end{array} \right] \end{array}$$

13 a) Given two fuzzy sets A and B, compute the following set operations on A and   (5)
       B:

       a) Algebraic sum b) Algebraic product c) Bounded sum d) Bounded difference

$$A = \left\{ \frac{1}{2} + \frac{0.5}{3} + \frac{0.3}{4} + \frac{0.2}{5} \right\}$$

$$B = \left\{ \frac{0.5}{2} + \frac{0.7}{3} + \frac{0.2}{4} + \frac{0.4}{5} \right\}$$

   b) Find the membership values of the triangular shape given below in isosceles,   (4)
       right angle and equilateral triangles, using inference method.
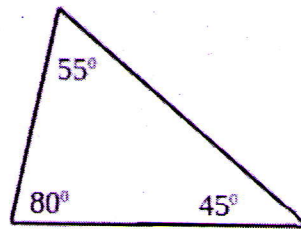
14   What is defuzzification? Explain different defuzzification methods with examples. (9)

PART E

Answer any four full questions, each carries 10 marks.

15 a)   Explain different types of fuzzy qualifiers. (4)

     b)   Explain the canonical form of fuzzy rule based system. What are the different methods for decomposition of compound fuzzy rules into canonical form? Explain. (6)

16 a)   Describe two methods for aggregation of fuzzy rules. (4)

     b)   Differentiate between Mamdani FIS and Sugeno FIS in detail. (6)

17 a)   Compare fuzzy systems with neural networks. What are the characteristics of neuro-fuzzy hybrid systems? (4)

     b)   What are the different classifications of neuro-fuzzy hybrid systems? Explain each with their architectural diagrams. (6)

18   Explain five different types of selection and crossover genetic operators. (10)

19 a)   Explain the difference between flipping, interchanging and reversing with example. (5)

     b)   What are the stopping conditions and termination techniques for genetic algorithm flow. (5)

20 a)   What is genetic-fuzzy rule based systems? Explain its block diagram and advantages. (4)

     b)   Differentiate between tuning and learning problems. Explain genetic tuning process, genetic learning of rule bases and genetic learning of knowledge bases. (6)

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