

B.E. Instrumentation Engineering (MODEL CURRICULUM) Semester-VII
IN703M - Artificial intelligence in Instrumentation

P. Pages : 2

Time : Three Hours



GUG/W/22/14258

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.

1. a) Define Membership function. Discuss following Membership functions in detail. 8
- i) Triangular MF
 - ii) Trapezoidal MF
 - iii) Gaussian MF
 - iv) Sigmoidal MF
- b) Fuzzy sets $A = \{0.7/1 + 0.5/2 + 0.1/3 + 0.6/4\}$ and $B = \{0.4/1 + 0.9/2 + 0.3/3 + 0.7/4\}$ 8
Calculate the following Set Theoretic Operations on Fuzzy Sets.
- i) $\bar{A} \cup B$
 - ii) $\bar{B} \cap A$
 - iii) $\bar{A} | B$
 - iv) $\bar{B} | A$

OR

2. a) Define the following nomenclatures used in fuzzy set theory: 8
- | | |
|--------------------------|---------------------|
| i) Support | ii) Core |
| iii) Cross – over points | iv) Height |
| v) Normality | vi) Fuzzy singleton |
| vii) Cardinality | viii) Fuzzy Number. |
- b) Define the following term with suitable example; 8
- i) Equality of fuzzy sets.
 - ii) Containment of a fuzzy set.
3. a) Two fuzzy sets A and B with universe of discourse X and Y, respectively defined as 8
- $$A = 0.2/x_1 + 0.4/x_2 + 0.5/x_3$$
- $$B = 0.5/y_1 + 0.1/y_2 + 0.7/y_3$$
- Find the following:
- i) Projection of fuzzy relation R on A
 - ii) Projection of fuzzy relation R on B
 - iii) Cylindrical extension of R_A in the direction of fuzzy set B i.e. $C(R_A)$
 - iv) Cylindrical extension of R_B in the direction of fuzzy set A i. e. $C(R_B)$
- b) Find Yager's class of complement of fuzzy set A given below for the values of 8
- $$w = \{0.5, 1, 2, 3\}$$
- i) $A = 0.7/1 + 0.5/2 + 0.1/3 + 0.6/4$

OR

4. a) Find the intersection of fuzzy sets A and B for the universe of discourse $X = \{1, 2, 3, 4\}$ using T – norm operators. 8
 $A = 0.7/1 + 0.5/2 + 0.1/3 + 0.6/4$
 $B = 0.8/2 + 0.3/3$
- b) Write a short note on: 8
i) Fuzzy IF Then Rules.
ii) Fuzzy Inference System.
5. a) Draw and discuss the following models of neurons: 8
i) Hard - limiting neuron.
ii) Soft – limiting neuron.
- b) Draw and discuss the architecture of feed forward neural network. 8

OR

6. a) Draw and discuss McCulloch – Pitts Neuron Model with its characteristics. 8
- b) Write a short note on: 8
i) Winner – take – all learning rule
ii) Outstar Learning rule
7. a) Define perceptron. Illustrate the basic concept of pattern classifier with block diagram. 8
- b) Elaborate the step – wise procedure for single continuous perceptron training algorithm to classify the given unknown patterns. 8

OR

8. a) Design and demonstrate a perceptron for performing “OR” function. Also state the limitations single layer perceptron. 8
- b) Illustrate error back propagation training algorithm for feed forward neural network with two continuous perceptron layers using block diagram. 8
9. a) Discuss the concepts of Machine learning with suitable example. 8
- b) Discuss with an example the principle of reinforcement learning with respect to machine learning. 8

OR

10. a) Illustrate with an example the concepts of deep learning with neural networks. 8
- b) Discuss the learning of multilayer perceptron using deep neural network. 8
