

BACHELOR OF ENGINEERING IN INFORMATION TECHNOLOGY
FOURTH YEAR 1ST SEMESTER EXAMINATION, 2019
ELECTIVE –II (FUZZY LOGIC & NEURAL COMPUTING)

TIME=3 HOURS

FULL MARKS=100

(CO1) (Answer any one either Q1 or Q2)

Q1.

(a) Explain why the law of contradiction and the law of exclusive middle are violated in fuzzy set theory.

(b) Define fuzzy set "near 5" based on the following information

$$A=[0:1:10] \text{ and } \text{Membership values}=[0.0,0.1,0.3,0.5,0.8,1.0,0.8,0.5,0.3,0.1,0.0]$$

(c) Find the α cut and strict α cut set of Fuzzy set A at $\alpha=0.3$ where the fuzzy set is given below

$$A=\{(1,0.3),(2,0.4),(3,0.8),(4,0.5),(6,0.3)\} \quad (3+3+4)=10$$

Q2.

(a) Find out the Algebraic sum of the two fuzzy set given below

$$A=\{(x1,0.2),(x2,0.5),(x3,0.7),(x4,0.8)\} \text{ and } B=\{(x1,0.5),(x2,0.8),(x3,0.0),(x4,0.6)\}$$

(b) Find out $(A \cap B) \cup (A \cap B^c)$ using the above two fuzzy set.

(5+5)=10

(CO2)

Q3.

(a) Let P and T two universe of discourse represents pressure and temperature respectively as follows

$$P=\{1,2,3,4\} \text{ and } T=\{10,15,20,25,30,35,40,45,50\}$$

Let the linguistic variable high temperature and low pressure are given as

$$T_{\text{High}}=\{(20,0.2),(25,0.4),(30,0.6),(35,0.6),(40,0.7),(45,0.8),(50,0.8)\}$$

$$P_{\text{Low}}=\{(1,0.8),(2,0.8),(3,0.6),(4,0.4)\}$$

Solve the rule given below using the above given fuzzy values and show all steps.

R: If temperature is High then Pressure is Low ($T_{\text{High}} \rightarrow P_{\text{Low}}$)

$$A = \frac{0.0}{a} + \frac{0.8}{b} + \frac{0.6}{c} + \frac{1.0}{d}$$

$$B = \frac{0.2}{1} + \frac{1.0}{2} + \frac{0.8}{3} + \frac{0.0}{4}$$

$$C = \frac{0.0}{1} + \frac{0.4}{2} + \frac{1.0}{3} + \frac{0.8}{4}$$

(b) If X is A then Y is B else Y is C

Find out the implication value using Larsen method and show all steps.

(c) Define primary term and new fuzzy term.

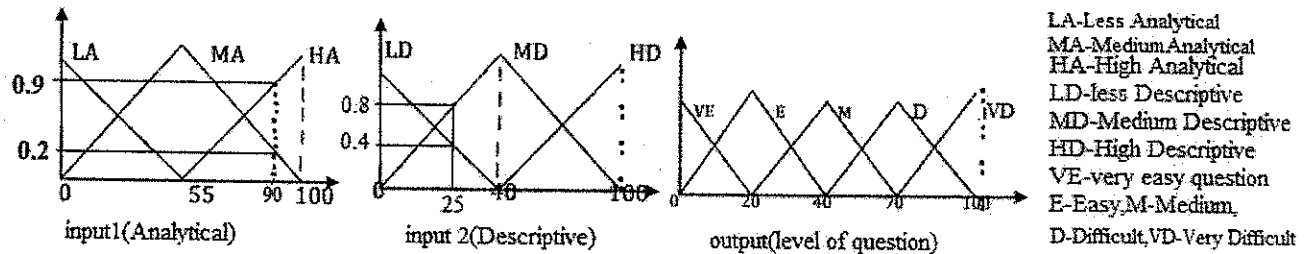
(8+10+2)=20

(CO3)

(Answer any one either Q4 or Q5)

Q4.

(a) Design a Fuzzy based controller to generate the level of question using the following 2 inputs (A, D), 1 output fuzzy set and the corresponding fuzzy rules. Derive the value of output (level of question) when input1 (A) =90 and input2 (D) =25.



Rules:

- R1: If A is Less Analytical and D is Less Descriptive then level of question is Very Easy
- R2: If A is Medium Analytical or D is Less Descriptive then level of question is Medium
- R3: If A is High Analytical or D is Less Descriptive then level of question is Very Difficult
- R4: If A is Less Analytical and D is Medium Descriptive then level of question is Easy
- R5: If A is Medium Analytical and D is Medium Descriptive then level of question is Difficult
- R6: If A is High Analytical or D is Medium Descriptive then level of question is Very Difficult
- R7: If A is Less Analytical and D is High Descriptive then level of question is Medium
- R8: If A is Medium Analytical and D is High Descriptive then level of question is Difficult
- R9: If A is High Analytical and D is High Descriptive then level of question is Very Difficult

(b) Write down some advantages of fuzzy based control systems over conventional control systems?
 ((10+5) +5)=20

Q5.

- (a) What is the difference between Mamdani controller and Sugeno Controller?
- (b) Suggest a design of a fuzzy control systems for Washing Machine. (5+15)=20

(CO4)

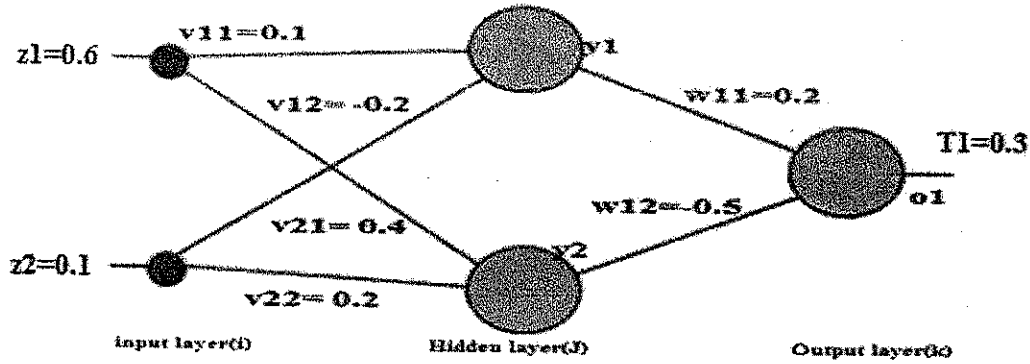
Q6.

- (a) Implement the AND function using McCulloh-Pitts neurons using binary data.
- (b) State True or False with proper explanation "All types of Boolean Function can be implement using single layer perceptron model".
- (c) Explain the different types of activation Functions Used in ANNs. (6+7+7)=20

(C05)

Q7.

(a) In the 2-2-1 feed forward architecture of the figure, train the network by hand calculations using Back propagation algorithm. (Assume learning rate coefficient $\eta = 0.6$)



(b) Explain the competitive learning. How does BAM work?

(10+(5+5))=20

(C06)

Q8.

(a) Explain the drawbacks of Fuzzy systems and neural network individually if any. State solution to overcome that drawbacks.

(5+5)=10

