



ROLL NO: _____

PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Weightage: 20 %

Max Marks: 20

Max Time: 1 hr.

Tuesday, 25th September, 2018

TEST – 1

Odd Semester 2018-19

Course: **ECE 310 Fuzzy Logic and Engineering Applications**

V Sem. ECE

Instruction:

- (i) Read the question properly and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and Non-programmable calculators are permitted.

Part A

(3 Q x 2 M = 06 Marks)

1. Name the two different types of uncertainty in the situations (a) "The room is Warm" and (b) "The Dice will fall on an odd number", and compare the two.
2. Fuzzy set $X = \left\{ \frac{0}{P} + \frac{0.2}{Q} + \frac{0.7}{R} + \frac{0.2}{S} + \frac{0}{T} \right\}$ is defined in a universe of discourse $U = \{P, Q, R, S, T\}$. Is the set (a) Normal or subnormal? (b) Symmetric or Non Symmetric (c) Define classical set membership by doing a **Lambda cut** of X at $\lambda = 0.1$ (d) Find the membership of **X AND X'**
3. State two laws of Classical sets which are false in Fuzzy and prove both with relevant curves.

Part B

(2 Q x 4 M = 08 Marks)

4. For the curves with respect to number of vehicles per 500 meters, the membership functions for various categories of traffic given by the following graphs shown in Figure 1.

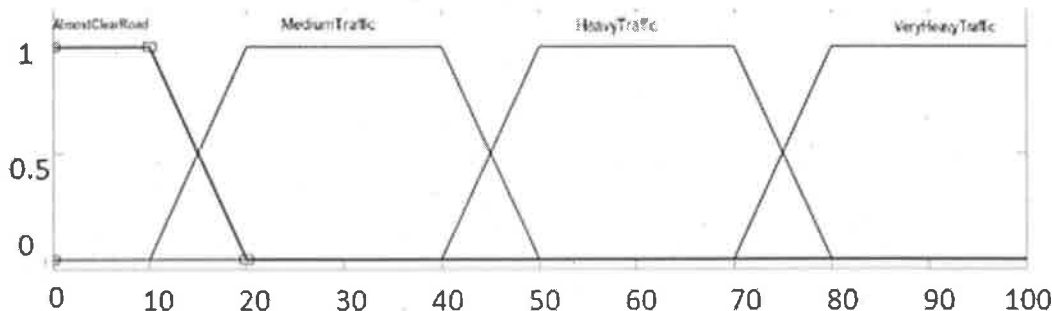


Fig.1

Find (a) "Medium **OR** Heavy" Traffic (b) "**Not** Very Heavy" Traffic (c) λ Cut of Medium at $\lambda = 0.5$ giving classical set "Medium" membership (d) Are these sets normal or subnormal?

5. Universes of Discourse are $A = \{a_1, a_2, a_3, a_4\}$, $B = \{b_1, b_2, b_3\}$, and $C = \{c_1, c_2, c_3, c_4, c_5\}$ with member sets

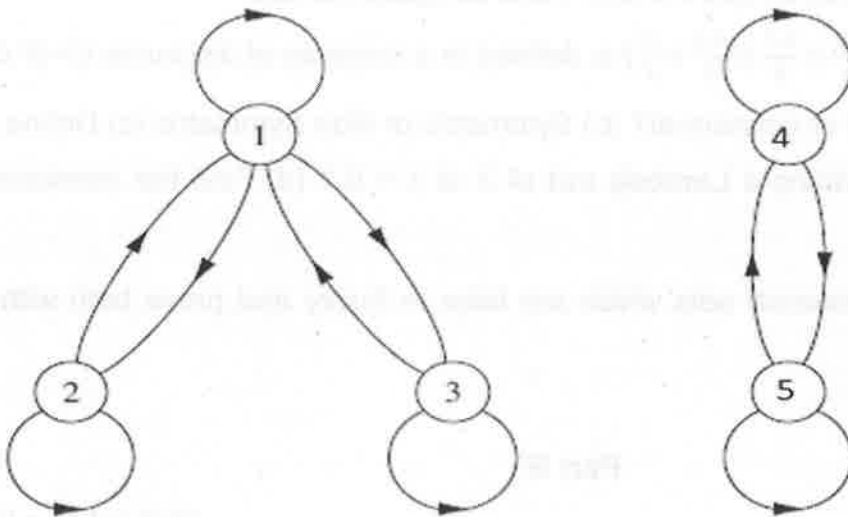
$$P = \left\{ \frac{0.2}{a_1} + \frac{0.3}{a_2} + \frac{0.6}{a_3} + \frac{0.8}{a_4} \right\}; Q = \left\{ \frac{0.2}{b_1} + \frac{1}{b_2} + \frac{0.2}{b_3} \right\}; \text{ and } R = \left\{ \frac{0.7}{c_1} + \frac{0.8}{c_2} + \frac{0.9}{c_3} + \frac{1}{c_4} + \frac{1}{c_5} \right\}$$

- (i) Identify at least two properties of Q that you can deduce, and state their values.
- (ii) Name all possible relations from the sets given;
- (iii) Calculate matrices of any two relations

Part C

(1 Q x 6 M = 06 Marks)

6. Assuming that the following graph represents a classical relation with only 1 and 0 values of each pair, deduce **all possible** properties of the relation.





**PRESIDENCY UNIVERSITY,
BENGALURU**

SCHOOL OF ENGINEERING

TEST 2

Odd Semester: 2018-19

Date: 28 November 18

Course Code: ECE 310

Time: 1 Hour

Course Name: Fuzzy Logic and Engineering Applications

Max Marks: 20

Branch & Sem: ECE & V Sem

Weightage: 20%

Instruction:

- (i) Read the question properly and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and Non-programmable calculators are permitted.

Part A

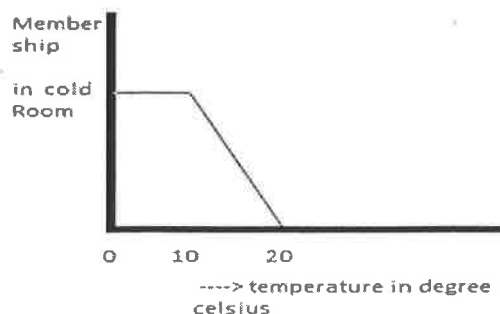
Answer **all** the Questions. **Each** question carries **two** marks. (3x2=6)

1. Given $\mu(x) = 0.8$ and $\mu(y) = 0.7$. Find Fuzzy OR and Fuzzy AND using (a) Bounded Sum and difference formula pair and (b) Algebraic sum and product formula pair.
2. Explain the concept of resolution Identity with figures.
3. Draw fuzzy graph for the rule set **Rule1:** x is small \rightarrow y is small; **Rule2:** x is medium \rightarrow y is large; and **Rule3:** x is large \rightarrow y is small taking both x and y being small and large as suitable width triangular memberships.

Part B

Answer **all** the Questions. **Each** question carries **three** marks. (3x3=9)

4. Define Bell Membership with equation and graph. Show the effect of each parameter.
5. Fuzzy Numbers are given as $x \sim 100$, Range from 90 to 110. Also $y \sim 10$, Range from 9 to 11. Draw x membership and y membership. Also draw $x+y$ and $x-y$. Specify ranges.
6. The curve for "Cold Room" is given. Draw **graphs** of curves for "Very Cold" and "Somewhat Cold". Find membership of 15° C in "Cold", "Very Cold" and "Somewhat Cold".



Part C

Answer the Question. Question carries **five** marks.

(1x5=5)

7. Explain in detail the concept of finding relation by Cosine amplitude with an example of

| Regions | a | b | c | d | e |
|---------|-----|-----|-----|-----|-----|
| Case1 | 0.3 | 0.2 | 0.1 | 0.7 | 0.4 |
| Case2 | 0.6 | 0.4 | 0.6 | 0.2 | 0.6 |
| Case3 | 0.1 | 0.4 | 0.3 | 0.1 | 0.0 |

For this table find relation between (a) a and itself and also (b) a and b using cosine amplitude method



| | | | | | | | | | | | | | | | | | | | |
|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Roll No. | | | | | | | | | | | | | | | | | | | |
|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

**PRESIDENCY UNIVERSITY
BENGALURU**
SCHOOL OF ENGINEERING

END TERM FINAL EXAMINATION

Odd Semester: 2018-19

Date: 29 December 2018

Course Code: ECE 310

Time: 2 Hours

Course Name: Fuzzy Logic and Engineering Applications

Max Marks: 40

Programme & Sem: ECE & V Sem

Weightage: 40%

Instructions:

- (i) No exchange of calculators allowed.
- (ii) Assume Standard Values where required

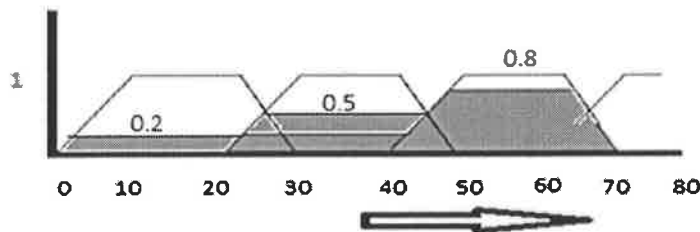
Part A

Answer **all** the Questions. **Each** question carries **three** marks. (5Qx3M=15)

1. If $X = \{1/x_1, 0.9/x_2, 0.3/x_3, 0/x_4\}$; $Y = \{0/y_1, 0.4/y_2, 0.8/y_3, 1/y_4, 1/y_5\}$; $Z = \{0/z_1, .5/z_2, 1/z_3, 0.6/z_4, 0.1/z_5, 0/z_6\}$ create fuzzy relations $X.Y$; $Y.X$; Infer $X.Z$ from min max composition.
2. For the pattern distribution given, find two clusters and their centers by fuzzy means



3. Defuzzify with Weighted average and MOM



4. If $A = \{0/a, 0/b, 0.3/c, 0.9/d, 1/e, 1/f\}$ and $B = \{0.1/p, 0.4/q, 0.8/q, 1/r\}$ Derive Godelian matrix and Goguen Matrix for $A \rightarrow B$
5. For the Universe of discourse $X = \{p,q,r\}$ how many crisp sets in power set? Name all possible crisp sets in the power set of this universe and draw the 3 dimensional hypercube showing their location. Where will all possible fuzzy sets lie in this 3 dimensional world?

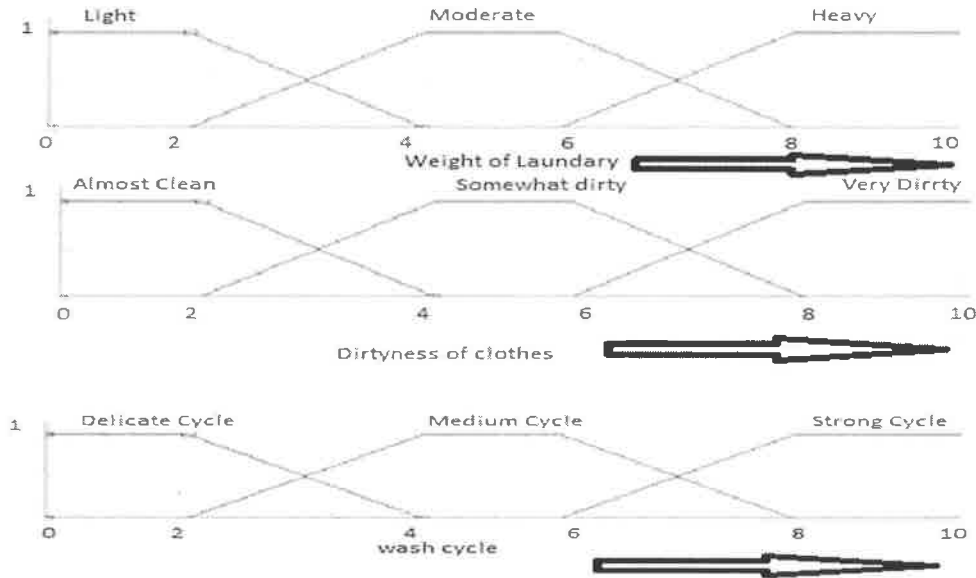
Part B

Answer **all** the Questions. **Each** question carries **five** marks.

(3Qx5M=15)

6. Define Subsethood and explain in detail how subsethood is inferred from any given membership distribution. Use at least 4 real life examples to explain the concept. For three sets "Tall Man"; "Very Tall Man" and "Somewhat Tall Man" draw memberships and explain which set is the superset / subset of which other sets.

7. Washing Machine Problem



Rules

| Weight → Dirtytness ↓ | Light | Moderate | Heavy |
|--------------------------|----------------|----------------|--------------|
| Almost Clean | Delicate Cycle | Delicate Cycle | Medium Cycle |
| Somewhat Dirty | Delicate Cycle | Medium Cycle | Strong Cycle |
| Very Dirty | Medium Cycle | Strong Cycle | Strong Cycle |

(a) Name Antecedants and Consequents

(b) Find the Gear For Weight, Dirtytness

(i) (1 1); (ii) (9 9) (iii) (2.5, 3.5)

8. Relation given by

$$R = \begin{matrix} & \begin{matrix} 0.2 & 0.4 & 0.6 & 0.8 & 1.0 & 1.2 \end{matrix} \\ \begin{matrix} 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{matrix} & \left[\begin{array}{cccccc} 0.75 & 1 & 0.85 & 0.5 & 0.2 & 0 \\ 0.5 & 0.8 & 1 & 0.7 & 0.3 & 0 \\ 0.1 & 0.5 & 0.8 & 1 & 0.7 & 0.1 \\ 0 & 0.2 & 0.5 & 0.85 & 1 & 0.6 \\ 0 & 0 & 0.2 & 0.5 & 0.9 & 1 \end{array} \right] \end{matrix}$$

(a) Draw the Graph

(b) Test 5 properties.

Part C

Answer the question. Question carries **ten** marks.

(1Qx10M=10)

9. Explain in complete detail the Structure and working of Mamdani control of Gear Selection. Take different example situations and explain.