TB25035W

Reg. No:.....

Name:.....

**B.Sc. DEGREE (C.B.C.S.S) EXAMINATION, MARCH 2025**

**(2016 and 2017 Admissions Supplementary)**

**SIXTH SEMESTER – CORE COURSE (MATHEMATICS)**

**MT6B11B- FUZZY MATHEMATICS**

**Time: 3 hours** **Maximum marks: 80**

**Part A**

**I. Answer all questions. Each question carries 1 mark)**

1) Give an example of a fuzzy set.
2) Define the standard complement of a fuzzy set A.
3) What are logic operations?.
4) Calculate [-2,3] + [3,8]
5) Write the canonical form of unconditional and qualified propositions.
6) Define modus tollens

**(6*1=6)**

**Part B**

**II. Answer any seven questions. Each question carries 2 marks)**

7) Give an example of a subnormal fuzzy set.
8) Prove that for any two fuzzy sets $A$ and $B$ defined on a universal set X, $|A|+|B| = |A \cup B| + |A \cap B|$
9) Describe the support and core of a fuzzy set.
10) State the characterization theorem of fuzzy intersections.
11) Explain a linguistic variable.
12) Describe the four arithmetic operations on closed intervals
13) Give an example of a multivalued logic.
14) Define a fuzzy complement.
15) Give an example of a dual triple.
16) Define Boolean algebra.

**(7*2=14)**

## Part C

**III (Answer any five questions. Each question carries 6 marks)**

17) State and prove any one of the three decomposition theorems for fuzzy sets.

18) Show that the standard fuzzy complement is neither cut worthy nor strong cut worthy.

19) Define fuzzy union with an example.

20) Prove that $i_{min}$ and $u_{max}$ are dual with respect to the standard fuzzy complement.

21) Let $A(x) = \begin{cases} 0, & x \leq -1 \text{ and } x > 3 \\ \frac{x+1}{2}, & -1 < x \leq 1 \\ \frac{3-x}{2}, & 1 < x \leq 3 \end{cases}$ and $B(x) = \begin{cases} 0, & x \leq 1 \text{ and } x > 5 \\ \frac{x-1}{2}, & 1 < x \leq 3 \\ \frac{5-x}{2}, & 3 < x \leq 5 \end{cases}$ find A-B

22) State the first and second characterization theorem of fuzzy complements.

23) Write a short note on fuzzy quantifiers.

24) Explain generalized hypothetical syllogism

**(5*6=30)**

## Part D

**IV (Answer any two questions. Each question carries 15 marks)**

25) Prove or disprove: The standard fuzzy intersection is cut worthy and strong cut worthy when applied to an infinite family of fuzzy sets.

26) Given a t-norm $i$ and an involutive fuzzy complement $c$, prove that the binary operation on [0,1] defined by $u(a,b) = c\left(i(c(a),c(b))\right)$ for all $a,b \in [0,1]$, is a t-conorm such that $< i,u,c >$ is a dual triple.

27) Let $i_\omega$ denote the class of Yager t-norms, prove that $i_{min}(a,b) \leq i_\omega(a,b) \leq min(a,b)$, for all $a,b \in [0,1]$.

28) Explain fuzzy propositions with examples.

**(2*15=30)**