

END SEMESTER EXAMINATION - OCTOBER 2025**SEMESTER 7 : INTEGRATED M.Sc. PROGRAMME COMPUTER SCIENCE - DATA SCIENCE****COURSE : 21UP7CRMCP21 : COMPUTATIONAL MATHEMATICS***(For Regular - 2022 Admission & Supplementary 2021 Admission)*

Time : Three Hours

Max. Weightage : 30

PART A**Answer any 8 questions**

1. Define mathematical logic.
2. Define the term $T(M)$
3. For each of the following sets, determine whether 2 is an element of that set.
 - a) $\{x \in \mathbb{R} \mid x \text{ is an integer greater than } 1\}$
 - b) $\{x \in \mathbb{R} \mid x \text{ is the square of an integer}\}$
 - c) $\{2, \{2\}\}$ d) $\{\{2\}, \{\{2\}\}\}$
 - e) $\{\{2\}, \{2, \{2\}\}\}$ f) $\{\{\{2\}\}\}$
4. Define fuzzy union $u(t - \text{conorm})$
5. Find α -cut of following fuzzy set A , $\alpha = 0.25, 0.75$
 $A(x) = \frac{x}{1+3x}$ where $X = [0, \infty)$
6. What is the meaning of transition systems?
7. Prove that 3 divides $n^3 + 2n$ whenever n is a positive integer.
8. What is meant by compound statement?
9. Prove that 2 divides $n^2 + n$ whenever n is a positive integer.
10. What is meant by contradictory formula?

(1 x 8 = 8 Weight)**PART B****Answer any 6 questions**

11. Verify following are fuzzy compliments
 $A(x) = 1 - x$
 $A(x) = \sqrt[w]{1 - x^w}$
 $A(x) = \frac{1-x}{1+\lambda x}$ where $\lambda \geq 0, x \geq 0$
12. State Kleene's theorem and Arden's theorem.
13. which of the formulas are well-formed
 a) $\neg P \vee Q$
 b) $P \vee Q$
 c) $P \rightarrow P \vee Q$
 d) $((((P \wedge (P \rightarrow Q) \rightarrow Q) \vee Q) \wedge (P \rightarrow Q)))$
14. Prove that every fuzzy compliment c satisfies the following
 1. $a \leq c(a)$ if and only if $a \leq e_c$
 2. $a \geq c(a)$ if and only if $a \geq e_c$
 where e_c is the equilibrium point
15. Draw the graph of the function $f(n) = 1 - n^2$ from $\mathbb{Z}$ to $\mathbb{Z}$.

16. Write the following statement in symbolic form
"The crops will be destroyed if there is a flood"
 17. Prove that $3+3 \cdot 5+3 \cdot 5^2+\dots+3 \cdot 5^n=3(5^{n+1}-1)/4$
whenever n is a nonnegative integer.
 18. How many ways are there to select a first-price winner and a third-price winner from 100 different paper who entered the context?
- (2 x 6 = 12 Weight)**

PART C
Answer any 2 questions

19. Determine whether each of these functions is a bijection from R to R .
a) $f(x) = 2x+1$
b) $f(x) = x^2+1$
c) $f(x) = x^3$
d) $f(x) = (x^2+1)/(x^2+2)$
20. Outline the procedures for transforming a nondeterministic system into a deterministic system.
21. Prove that a fuzzy set A on R is convex if and only if $A(\lambda x_1 + (1 - \lambda) x_2) \geq \min\{A(x_1), A(x_2)\}$
for all $x_1, x_2 \in R$ and all $\lambda \in [0, 1]$, where $\min$ denotes the minimum operator.
22. Construct the truth table of $(P \wedge (P \rightarrow Q) \rightarrow Q)$

(5 x 2 = 10 Weight)