MSc DEGREE (CSS) EXAMINATION , JANUARY 2022

Second Semester

M.Sc.COMPUTER SCIENCE (DATA ANALYTICS)

CORE - CA030201 - MATHEMATICS FOR DATA ANALYTICS

2019 Admission Onwards

A9664BFF

Time: 3 Hours	Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Let p and q be the propositions " Swimming at the New Jersy shore is allowed" and " Sharks have been spotted near the shore" respectively .
   Express each of these compound proposition as an English sentence.
   a) $\neg q$
   b) $p \wedge q$
   c) $\neg p \vee q$
   d) $\neg p \wedge (p \vee \neg q)$

2. Draw the truth table for the biconditional statement $p \leftrightarrow q$ and determine wether the following biconditionals are true or false.
   a) 2+2=4 if and only if 1+1=2
   b) 1+1=2 if and only if 2+3=4
   c) 1+1=3 if and only if monkey can fly
   d) 0>1 if and only if 2>1.

3. a) Define predicate and give example.
   b) Let A(c,n) denote the statement " Computer c is connected to network n.", where c is a variable representing a computer and n is a variable representing a network. Suppose that the computer MATH1 is connected to network CAMPUS2, but no to network CAMPUS1. What are the values of A(MATH1,CAMPUS1) and A(MATH1,CAMPUS2).

4. *For every set S, prove that (i) $\emptyset \subseteq S$ (ii)$S \subseteq S$.*

5. *Define difference and find A-B , B-A , A- ($A \cap B$) Where $A = \{0, 2, 4, 6, 8, 10\}$ and $B = \{0, 1, 2, 3, 4, 5, 6\}$.*

6.	*Define vector space and give example.*

7.	*Define hyperplane. Describe special types of hyperplanes.*

8.	Define Frechet Derivatives and give example.

9.	Give the general idea of a membership value of a fuzzy set with suitable examples.

10.	Define the standard operations on fuzzy sets.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11.	Which of the following sentences are propositions justify your answer. a)Donot Pass go. b)4+x=5 c)x+2=11 d) Answer thie question. e)2^n≥100

12.	What is the negation of each of these propositions a) Today is thursday. b) There is no polution in Ernakulam c)2+1=3 d)The summer in Palakkad is hot and sunny. e) At least 10 inches of rain fell today in Chirapunchi.

13.	Prove that $\lfloor -x \rfloor = -\lceil x \rceil$ and $\lfloor x + n \rfloor = \lfloor x \rfloor + n$

14.	*Define countable and uncountable sets. Prove that the set of all integers is countable.*

15.	*Find the rank of $A = \begin{bmatrix} 1 & 3 & -2 & 5 & 4 \\ 1 & 4 & 1 & 3 & 5 \\ 1 & 4 & 2 & 4 & 3 \\ 2 & 7 & -3 & 6 & 13 \end{bmatrix}$.*

16.	Define inner product. Let $\alpha = (x_1, x_2, \ldots x_n)$ and $\beta = (y_1, y_2, \ldots y_n)$, prove that $x_1 \bar{y}_1 + x_2 \bar{y}_2 + \ldots \ldots + x_n \bar{y}_n$ is an inner product on C^n.

17.	Write a short note on Steepest Descent method.

18.	*Write a short note on type 2 fuzzy set, type 3 fuzzy set and type n fuzzy set.*

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. a) What are the negations of the statements $\forall x(x^2 > x)$ and $\exists x(x^2 = 2)$.

b) Show that $\neg\forall x(P(x) \rightarrow Q(x))$ and $\exists x(P(x) \wedge \neg Q(x))$ are logically equivalent.

c) Expree the statements "Some student in this class has visited Mexico" and " Every student in this class has visited either Canada or Mexico." using predicates and quantifiers.

20.
1. *(a) State and prove distributive laws for sets.*

   (b) For any three sets A,B and C , prove that (A-B)-C=(A-C)-(B-C)

21. *Find the rank and eigen values of the matrix* $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 2 \\ 1 & 1 & 2 \end{bmatrix}$.

22.   *Let*

$$A(x) = \begin{cases} 0 & when\ x \leq 20\ or\ \geq 60 \\ \dfrac{(x-20)}{15} & when\ 20 < x < 35 \\ \dfrac{(60-x)}{15} & When\ 45 < x < 60 \\ 1 & when\ 35 \leq x \leq 45 \end{cases}$$

$$B(x) = \begin{cases} 0 & when\ x \leq 45 \\ \dfrac{(x-45)}{15} & when\ 45 < x < 60 \\ 1 & when\ x \geq 60 \end{cases}$$

Find $^\alpha A$, $^\alpha B$, $^{\alpha+}A$ $^{\alpha+}B$ $for\ any\ \alpha \in$ (0,1]