Q.P Code	D 112647 Total Pages: 3	Name
		Register No.

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2024

(CUFYUGP)

MAT1MN104-Mathematical Logic, Set Theory and Combinatorics

2024 Admissions

Maximum Time :2 Hours	**Maximum Marks :70**

Section A

All Question can be answered. Each Question carries 3 marks (Ceiling : 24 Marks)

1	Explain Conjunction and Disjunction with truth tables
2	Express the negation of the proposition "No one can keep a secret"symbolically, and then express the negation in English.
3	Define infinite and finite sets. Give examples
4	Using truth tables, show that $A \cup B = B \cup A$
5	Using the Venn diagram, mark the set $A - (B - C)$
6	Define Polynomial Function, Exponential Function and Logarithmic Function
7	Find the domain and range of $f(x) = \frac{1}{\sqrt{x}}$; x is a real number
8	Let $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$. Find a 2×2 non zero matrix B such that $AB = BA$
9	Find the number of three-letter words that begin with the letters $\{A, B, C, D\}$
10	Five marbles are selected at random from a bag of seven white and six red marbles. Find the probability of 3 are white and 2 are red

Section B

All Question can be answered. Each Question carries 6 marks (Ceiling : 36 Marks))

11	Simplify the boolean expression $$p \wedge (p \vee \sim q) \wedge (\sim p \vee \sim q)$$
12	Check the validity of the following arguments. If Peter is married, he is happy. If he is happy, then he does not read the computer magazine. He does read the computer magazine. $\therefore$ Peter is unmarried.
13	Prove that $(A \cap B)' = A' \cup B'$
14	Simplify the set expression $(A \cap B') \cup (A' \cap B) \cup (A' \cap B')$.
15	Find the number of positive integers less than or equal to 3076 and divisible by 3, 5, or 7.
16	Let $A = \begin{bmatrix} 2 & 3 & 6 \\ 9 & 3 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ 3 & 5 \\ 9 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 1 & 0 \end{bmatrix}$. Show that $A(B + C) = AB + AC$
17	Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that 1. all vowels occur together 2. all vowels do not occur together
18	Flight A is on time for 93% of flights. Flight B is on time for 89% of flights. Flight A and B are both on time 87% of the time. What is the probability that at least one flight is on time?

Section C

Answer any ONE. Each Question carries 10 marks (1x10=10 Marks))

19	If the domain consists of all people, then translate each of these statements into logical expressions using predicates, quantifiers, and logical connectives. 1. None is perfect. 2. Not everyone is perfect. 3. All your friends are perfect. 4. At least one of your friends is perfect.
20	Prove that the number of leap years l after 1600 and not exceeding a given year y is given by $$\left\lfloor \frac{y}{4} \right\rfloor - \left\lfloor \frac{y}{100} \right\rfloor + \left\lfloor \frac{y}{400} \right\rfloor - 388$$