Reg. No .... Name **22U135**

B. Sc. DEGREE END SEMESTER EXAMINATION : OCTOBER 2022

SEMESTER 1 : MATHEMATICS (COMMON FOR B.Sc. COMPUTER APPLICATION AND BCA)

COURSE : **19U1CRCMT1/19U1CPCMT1 : FOUNDATION OF MATHEMATICS**

(For Regular – 2022 Admission and Improvement / Supplementary - 2021/2020/2019 Admissions)

Time : Three Hours Max. Marks: 75

PART A

Answer any 10 (2 marks each)

1. If U={2,4,6,8,10,12,14,16,18,20}, A={4,6,10,12,18} and B={4,8,12,16,20}.Find the bit strings representing A and AUB.
2. Translate the following system specification as logical expression.
“When a message is not sent from an unknown system ,it is not scanned for virus”.
3. Find the domain and range of the function that assigns to each positive integer its largest decimal digit.
4. Find $\sum_{i=0}^{2}\sum_{j=0}^{3}\left(2i+3j\right)$.
5. Which of these collections of subsets are partitions of {−3,−2,−1, 0, 1, 2, 3}?
a) {−3,−1, 1, 3}, {−2, 0, 2}
b) {−3,−2,−1, 0}, {0, 1, 2, 3}
c) {−3, 3}, {−2, 2}, {−1, 1}, {0}
d) {−3,−2, 2, 3}, {−1, 1}
6. State Domination laws on sets.
7. a) Define a maximal element of a poset and the greatest element of a poset.
b) Give an example of a poset that has three maximal elements.
c) Give an example of a poset with a greatest element.
8. Let R be be the relation R = {(a,b): a divides b} on the set of integers.
Find (a) R^{-1} (b) R
9. What is the composite of the relations R and S, where R is the relation from {1, 2, 3} to {1, 2, 3, 4} with R = {(1, 1), (1, 4), (2, 3), (3, 1), (3, 4)} and S is the relation from {1, 2, 3, 4} to {0, 1, 2} with S = {(1, 0), (2, 0), (3, 1), (3, 2), (4, 1)}?
10. Find the bitwise OR, bitwise AND, and bitwise XOR of the bit strings 0110110110 and 1100011101.
11. For any three integers, a, b, c, prove If a|b, then a|bc
12. Prove that every cube is of the form 9m or 9m + 1

(2 x 10 = 20)

PART B

Answer any 5 (5 marks each)

13. Explain basic operations on sets.
14. Show that the set of odd positive integers is a countable set.

15. a) Show that congruence modulo m is an equivalence relation whenever m is a positive integer.
b) Show that the relation {(a, b) | a ≡ ±b (mod 7)} is an equivalence relation on the set of integers.

16. Prove that $n^{12} - a^{12}$ is divisible by 13, if n and a are prime to 13.

17. Prove that for every set S, (i)$\emptyset \subseteq S$ and (ii) $S \subseteq S$.

18. Determine whether the following relations on the set of all people is reflexive, symmetric, antisymmetric and transitive:
a) a is taller than b.
b) a and b were born on the same day.
c) a has the same first name as b.
d) a and have a common grandparent.

19. Construct the truth table of the compound proposition: $(p \vee q) \rightarrow (p \oplus q)$.

20. Find the g.c.d of the pair of integers 2210 and 493 and express it as a linear combination of the two integers.

(5 x 5 = 25)

PART C

Answer any 3 (10 marks each)

21. a) Prove by contradiction that "if 3n+2 is odd then n is odd".
b) Give a direct proof to show that the product of two perfect squares is a perfect square.

22. Draw the Hasse diagram representing the partial ordering {(a, b) |a divides b} on {1, 2, 3, 4, 6, 8, 12}.

23. Show that $7^{2n+1} + 1 = M(8)$.

24. If a and r are real numbers and

$r \neq 0$ then $\sum_{j=0}^{n} ar^{j} = \frac{ar^{n+1} - a}{r-1}\ if\ r \neq 1.$ and $\sum_{j=0}^{n} ar^{j} = (n+1)a$ if $r = 1.$

(10 x 3 = 30)