QP CODE: 18103824

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Reg No : ....

Name : ....

B.Sc.DEGREE(CBCS)EXAMINATION, DECEMBER 2018

First Semester

Complementary Course - MM1CMT03 - MATHEMATICS - DISCRETE MATHEMATICS (I)

(Common to B.Sc Computer Science Model III, Bachelor of Computer Application)

2018 Admission only

A9D52F36

Maximum Marks: 80 **Time: 3 Hours**

Part A

Answer any **ten** questions.

Each question carries **2** marks.

1. Construct the truth table of $p \oplus p \vee q$
2. Prove $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.
3. Define Universal Quantifier . Give example.
4. Define cartesian product of two sets. What is the Cartesian product A x B, if A $= \{$a,b,c$\}$and B $= \{1,2\}$
5. Distinguish between one - to- one and onto functions.
6. Find $\sum_{k=50}^{100} k^2$
7. Find 'a div m' and 'a mod m' when
   (a) a = 228, m = 119 (b) a = 9009, m = 223
8. Give an example of Public key Cryptography
9. Define linear congruences
10. List the ordered pairs in the relation R from A = {0,1,2,3,4} to {0,1,2,3} where (a,b) $\in$ R if and only if (i) a = b (ii) a > b
11. Define a partition of a set.
12. What do you mean by Hasse diagram of a partial order?

(10×2=20)

Part B

Answer any **six** questions.

Each question carries **5** marks.

13. Show that $\exists x[p(x) \wedge q(x)] and \exists x p(x) \wedge \exists x q(x)$ are not logically equivalent.
14. State and prove hypothetical syllogism
15. Show that the premises " Everyone in this discrete mathematics class has taken a course in Computer Science " and " Marla is a student in this class " imply the conclusion " Marla has taken a courst in Computer Science"
16. Find $\cup_{i=1}^{\infty} A_i and \cap_{i=1}^{\infty} A_i$ for every positive integers i where $A_i =$ [-i, i].

17. Display the graph of the function $f(x) = x^2$ from the set of integers to the set of integers.

18. Let m be a positive integer. If $a \equiv b(mod\ m)\ and\ c \equiv d(mod\ m)\ then\ (a\ +\ c) \equiv (b\ +\ d)\ (modm)$

19. (a) Define prime and composite numbers with examples
(b) Do the prime factorization of 10!

20. Suppose that the relation R on a set is represented by the matrix $M_R = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$. Is R reflexive, symmetric or anti symmetric?

21. Show that the relation R consisting of all pairs (x,y) such that x and y are bit strings for which first bits as well as third bits are same is an equivalence relation.

(6×5=30)

Part C

Answer any **two** questions.

Each question carries **15** marks.

22. (a) Define simple and compound propositions and construct the truth table of conjunction and disjunction of two propositions
Explain the term 'Exclusive or "with truth table.
(b) Construct the truth table for inverse, converse and contrapositive of $p \to q$.
(c) Let p and q be the propositions p:" Swimming at the New Jersey shore is allowed." q: Sharks have been spotted near the shore." construct the following compound proposition as an English sentence $\neg p \to \neg q$.

23. Explain sequences and summation. Also explain special integer sequences with examples.

24. Explain with examples (a) Public key Cryptosystems (b) Private key Cryptosystems

25. a. Let R be the relation represented by the matrix $M_R = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$. Find the matrix represented by
1) Complement $\overline{R}$ 2) R^2
b. Let A= {1,2,3}, B= {2,3,4,5,6}, R_1= {(1,2), (1,3), (2,3), (2,5), (3,4), (3,5)}, and R_2 ={(1,4), (1,6), (2,3), (3,5), (3,6)}. Find $R_1 \cup R_2$, $R_1 \cap R_2$ and $R_1 - R_2$.

(2×15=30)