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Reg. No...............................

Name...................................

B.Sc. DEGREE (CBCS) EXAMINATION, JANUARY/FEBRUARY 2018

First Semester

DISCRETE MATHEMATICS—I

[Complementary Course to B.Sc. Computer Science Model III and B.C.A.]

(2017 Admissions)

Time : Three Hours

Maximum Marks : 80

Part A

Answer any **ten** *questions.*
Each question carries 2 marks.

1. Define Conjunction and Disjunction.
2. What is the negation of the proposition 'Today is Thursday' ?
3. Use tenth table to verify $p \vee q \equiv \equiv q \vee p$.
4. Define set. Give example of set ?
5. Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{0, 3, 6\}$. Find $A' \cup B'$.
6. Write the following sets in the set-builder form :

   (a) $A = \{1, 8, 24, 64\}$.

   (b) $B = \{0, 3, 6, 9....\}$.
7. What is the fundamental theorem of arithmetic ?
8. What are the quotient and remainder ? When 101 is divided by 11.
9. Find the prime factorization of 7007.
10. Define a lattice.
11. Is the "divides" relation on the set of positive integers reflexive ?
12. Let $R_1 = \{(1, 2), (2, 3), (3, 4)\}$ and $R_2 = \{(1, 1), (1, 2), (2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3), (3, 4)\}$ be relations from $\{1, 2, 3\}$ to $\{1, 2, 3, 4\}$. Find :

    (a) $R_1 - R_2$.   (b) $R_2 - R_1$.

$(10 \times 2 = 20)$

Turn over

Part B

Answer any **six** *questions.*
Each question carries 5 *marks.*

13. Show that $(p \to q)$ and $\neg q \to \neg p$ are logically equivalent.

14. Show that $p \vee (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent.

15. Show that the premises "A student in this class has not read the book" and "Everyone in this class passed the first exam" imply the conclusion "some one who passed the first exam has not read the First Book".

16. Using set builder notation and logical equivalence to establish the De Morgan's law $\cdot a \cdot (A \cap B)' = A' \cup B'$.

17. Show that the set of all even positive integers is a countable set.

18. Define prime and composite numbers. Prove that there are infinitely many primes.

19. Let m be a positive integer. Then prove that the integers a and b are congruent modulo m if and only if there is an integer k such that $a = b + km$.

20. Show that the "divides" relation on the set of positive integers is not an equivalence relation.

21. Show that the relation R on a set A is transitive if and only if $R^n \subseteq R$ for $n = 1, 2, 3, \ldots$

$(6 \times 5 = 30)$

Part C

Answer **two** *questions.*
Each question carries 15 *marks.*

22. (a) Use the truth table method to prove that the De Morgan's laws :

    (i) $(A \cup B)' = A' \cap B'$.

    (ii) $(A \cap B)' = A' \cup B'$.

    (b) Show that $p \vee (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent.

23. Explain set and its operation with examples. Also explain different types of sets.

24. State and prove the Chinese Reminder Theorem.

25\. (a) Let R be the relation represented by the matrix :

$$M_R = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}.$$

Find the matrices that represent.

(i) R^2.

(ii) R^3.

(iii) R^4.

(b) Let R be the relation on the set of people such that xRy if x and y all people and x is order than y. Show that R is not a partial ordering.

(2 × 15 = 30)