PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2023

Semester : Semester III - 2021   **Date :** 5-JAN-2023
Course Code : MAT2004   **Time :** 1.00PM - 4.00PM
Course Name : Sem III - MAT2004 - Discrete Mathematical Structures   **Max Marks :** 100
Program : B.Tech.- CSE and Allied   **Weightage :** 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.

PART A

ANSWER ALL THE TEN QUETIONS   **10 X 2 = 20M**

1. Find the bitwise OR and bitwise AND of the bit strings *01 1011 0110* and *11 0001 1101*.
                                                                (CO1) [Knowledge]

2. State which rule of inference is the basis of the following argument: "It is below freezing and raining now. Therefore, it is below freezing now."
                                                                (CO1) [Knowledge]

3. Write the following statements in symbolic form:
    (i).   Something is good
    (ii).   Everything is good

                                                                (CO1) [Knowledge]

4. Let 'f' and 'g' be the functions from positve real numbers to positive real numbers such that $f(x) = [3x] , g(x) = 5x$, then calculate $(f \circ g)$ and $(g \circ f)$
                                                                (CO2) [Knowledge]

5. If A = { 1, 3, 4 } and R = { (1, 3), (3, 3), (1, 4) }. Find the reflexive closure of R?
                                                                (CO2) [Knowledge]

6. What are the equivalence classes of 0 and 1 for congruence modulo 4?
                                                                (CO2) [Knowledge]

7. If the matrix representing R is $M_R = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$. Find the matrix representing R^2.
                                                                (CO2) [Knowledge]

8. For the poset ({1, 2, 3, 4, 6, 12}, |), find all upper bounds of {2, 6}.

(CO3) [Knowledge]

9. Find the minimum number of students in a class such that at least 4 of them are born in the same month?

(CO4) [Knowledge]

10. How many strings of length r can be formed from the lowercase and uppercase letters of the English alphabet?

(CO4) [Knowledge]

PART B

ANSWER ALL THE FIVE QUESTIONS   5 X 10 = 50M

11. Show that p ↔ q and ¬p ↔ ¬q are logically equivalent by
    a) truth table method and b) replacement method

(CO1) [Comprehension]

12. Show that the following argument is valid.
    "John, a student in this class, knows how to write programs in JAVA. Everyone who knows how to write programs in JAVA can get a high-paying job. Therefore, someone in this class can get a high-paying job".

(CO1) [Comprehension]

13. If R be the relation on the set of real numbers such that aRb if and only if a − b is an integer. Is R an equivalence relation?

(CO2) [Comprehension]

14. Solve the system of congruences x ≡ 1 (mod 5), x ≡ 1 (mod 7), x ≡ 3 (mod 11) using chinese remainder theorem.

(CO4) [Comprehension]

15. (i) How many ways are there to distribute hands of 4 cards to each of 6 players from the standard deck of 52 cards?
    (ii)How many ways are there to pack five copies of the same book into five identical boxes, where a box can contain as many as five books?

(CO4) [Comprehension]

PART C

ANSWER ALL THE TWO QUESTIONS   2 X 15 = 30M

16. a. Show that the premises "It is not sunny this afternoon and it is colder than yesterday," "We will go swimming only if it is sunny" , "If we do not go swimming, then we will take a canoe trip," and "If we take a canoe trip, then we will be home by sunset" lead to the conclusion "We will be home by sunset." **(8M)**
    b. Find the PCNF form for (p ↔ q) using truth table. **(7M)**

(CO1) [Application]

17. Show that ({1, 5, 6, 30}, |) is a Boolean algebra.

(CO3) [Application]

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