Student's Name: **Enrollment No:** **Date:**	rishihood university

Sample Paper

Course Code: CSA102
Course Title: Mathematics-1

Programme: B.Tech. **Semester: I**

Duration: 2 hrs. **Max. Marks: 45**

➔ **Instructions:**

- Do not write anything on the question paper except Name, Enrollment no. and Date.
- All questions are compulsory.

Section A

Answer the following questions based on the given Instructions:

1. Express the statement using quantifiers, also the negation of the statement in simple English.
   " There is no dog that can talk". [2]

2. Determine whether each of these pairs of sets are equal. [2]
   a. {1,3,3,3,5,5,5,5,5}, {5,3,1}
   b. {{1}}, {1, {1}}

3. Let A, B and C be sets, show that [2]
   [AU(B ⋂ C)']' = (C' ⋂ B') ⋂ A'

4. A company has 10 engineers, and they need to form a project team of 4 engineers. How many different teams can be formed if two specific engineers must always be included in the team? [2]

5. The ratio of the two numbers is 3:5, and their HCF is 9. What is the LCM of the two numbers? [2]

Section B

6. An engineering firm uses a password system that requires a 3-letter code followed by a 2-digit number. If letters can be repeated but digits cannot, how many different passwords can be created? [3]

7. A chemist has two solutions: one is 30% acid and the other is 70% acid. How many litres of each solution must be mixed to create 10 litres of a solution that is 50% acid? [3]

8. There are 100 closed doors in a row. You toggle (open/close) the doors in the following manner: On the first pass, you toggle every door (1 to 100). On the second pass, you toggle every 2nd door (2, 4, 6, ...). On the third pass, you toggle every 3rd door (3, 6, 9, ...), and so on, until the 100th pass. If you had 290 doors instead of 100, how many doors would remain open after all the passes and why? [3]

9. Solve the equation $|2x - 3| + |x + 7| = 7$ [3]

10. You are given two integers N and K. Here, N represents the total number of distinct points on a 2D plane, and K (K>2) represents the number of points that are collinear (lie on the same straight line).
    Write a Python program that calculates and prints the total number of triangles that can be formed by choosing any three points from the N points. [3]

Section C

11. In a collection of 11 different integers selected from the range 1 to 20, show that there are at least two integers whose sum is 21. [5]

12. A gardener wants to create rectangular plots in a garden that has an area of 240 square metres. The gardener wants the length and width of each plot to be whole numbers. If the plots must have an equal area and be as large as possible, what are the dimensions of the largest possible square plot? [5]

13. Solve -
    a. Find the total number of positive divisors of the number 1440. [2]
    b. Express the number 1200 as a product of prime factors and identify the largest prime factor. [3]

14. Construct a truth table for
    a. $(p \rightarrow q) \vee (\sim p \rightarrow r)$
    b. $(p \leftrightarrow q) \vee (\sim q \leftrightarrow r)$ [5]