PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
Department of Applied Sciences & Humanities
Third Semester B. Tech (CSE, IT) (2025-26)
Discrete Mathematics (303191202)
Assignment 2

1. Consider the poset as shown in Figure-b (Hasse diagam). Find the following:
   a. Find the maximal elements.
   b. Find the minimal elements.
   c. Is there a greatest element?
   d. Is there a least element?
   e. Find all upper bounds of $\{a, b, c\}$.
   f. Find the least upper bound of $\{a, b, c\}$, if exists.
   g. Find the lower bounds of $\{f, g, h\}$.
   h. Find the greatest lower bound of $\{f, g, h\}$, if it exists.

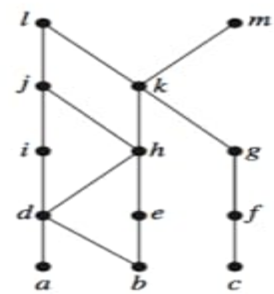

Figure-b

2. How many four-digit numbers can be formed using the digits 0, 3, 4, 5, 6, 7 if
   (i) Repetition of digits is not allowed ?
   (ii) Repetition of digits is allowed ?

3. State the converse, contrapositive, and Inverse of the proposition,
   "If 7 is greater than 5, then 8 is greater than 6".

4. Prove by constructing truth table, $\neg(p \vee q) \equiv \neg p \wedge \neg q$ are logically equivalent.

5. Prove that if n is an integer and 3n + 2 is odd, then n is odd.

6. Prove that the sum of two rational numbers is a rational number.

7. Use mathematical induction to prove

$$1^2 + 3^2 + 5^2 + \cdots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}.$$

8. Find if the following is a tautology, contradiction or contingency:

$$\big(p \longrightarrow (q \to r)\big) \to \big((p \to q) \to (p \to r)\big).$$

9. a) Show that $\neg p \leftrightarrow q$ and $p \leftrightarrow \neg q$ are logically equivalent.

b) Show that $\neg(p \oplus q)$ and $p \leftrightarrow q$ are logically equivalent.

10. Construct a truth table for each of these compound propositions.

a) $\big((p \rightarrow q) \rightarrow r\big) \rightarrow s$ b) $(p \wedge q) \rightarrow (p \vee q)$