Tutorial 3

Relations

Q.1 Relation

Let A be the set of all lines in the 2-dimensional plane. Let R be the relation on A defined by l_1Rl_2 iff l_1 is perpendicular to l_2 .

- a) Is it reflexive?
- b) Is it symmetric?
- c) Is it antisymmetric?
- d) Is it transitive?

Q.2 Equivalence Relation

Let *S* be the set of all digital logic circuit with two inputs and one output.

Let *R* be defined on *S* as follows:

 c_1Rc_2 iff c_1 has the same input/output table as c_2 .

- a) Explain why R is an equivalence relation.
- b) How many distinct equivalence classes are there?
- c) Find two different circuits that are in the same equivalence class.

Q.3 Partial Order

Let $A = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$. Consider the relation R on A defined as xRy iff x is a factor of y.

- a) Prove that *R* is a partial order.
- b) List all maximal elements.
- c) List all minimal elements.

Q.4 Congruence

Let $a \equiv b \pmod{n}$ and $c \equiv d \pmod{n}$. Prove that $a + c \equiv b + d \pmod{n}$.