**Lab 06 - Logic and Proof**

**Objective**

Solving exercises from the textbook in chapter 1.6-1.8

**Current Lab Learning Outcomes (LLO)**

By completion of the lab, the students should be able to:

1. Students will understand Methods of proof.

2. They will be able to solve shorter/easier or longer / harder problems given in the textbook.

**Lab Requirements**

Students allowed using their lecture notes in the lab in order to solve the exercises.

**Lab Assessment**

1- Divide students to groups and let them to solve the given example.

2- Discuss the answers with the groups and write on board the optimal solution.

**Lab Description**

In this lab, the following exercises are going to be solved and explained to them:

1. Use a proof by contradiction to prove that the sum of an irrational number and a rational number is irrational.
2. Show that these statements about the integer *x* are equivalent:

(i) 3*x* + 2 is even, (*ii*) *x* + 5 is odd, (*iii*) *x*2 is even.

1. Show that if *n* is an integer and *n*3 + 5 is odd, then *n* is even using

**a)** a proof by contraposition.

**b)** a proof by contradiction.

1. Prove the following statement by contradiction if n2 is odd, then n is odd.
2. Show that at least ten of any 64 days chosen must fall on the same day of the week.
3. Prove that If you are studying CPCS222 then you are human (domain is all people), what kind of proof did you use.
4. Show that if x2≥0 then x2+2x+1≥0 (Domain is of all real numbers). what kind of proof did you use.
5. Show that if x2+1<0 then 2x2+5x+1= 0 (Domain is of all real numbers). what kind of proof did you use.
6. Prove that if *x* and *y* are real numbers, then max*(x, y)* +min*(x, y)* = *x* + *y*. [*Hint:* Use a proof by cases, with the two cases corresponding to *x* ≥*y* and *x < y*, respectively.]
7. Prove that there is no positive integer *n* such that *n*2+ *n*3= 100.
8. Show that the implication If x > 0, then x 2 + 5 > 0. Where x is any real number.
9. Prove that there are no solutions in integers *x* and *y* to the equation 2*x*2 + 5*y*2 = 14.
10. prove that the following implication is true, where x is a real number and n is a constant.

what ever the value of x then x2 + 1 > 0 is always true . So without considering p, q is always true.