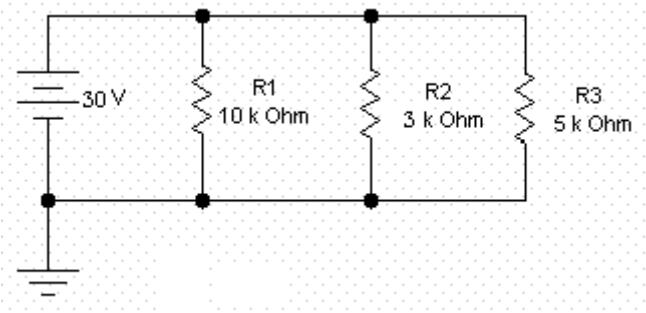
Task1 : Pass Grade – P1.1

The company asked you to prepare a lab session to train newly joined technicians on measurements of currents and resistances. They need you to execute the following lab session:

Using Multisim

Use MultiSim software to build the circuit shown below:



Use the program to predict the values of the total resistance , total current and the currents in each of the three branches, record your values in the following table:

Quantity	Predicted value (from Multisim)	Measured Value	% Error
R_T			
i_T			
i_1			
i_2			
i_3			

Using Breadboard

Build the above circuit on a breadboard and use a real multimeter to measure the quantities listed in the above table. Record your measured values in the column
called "Measured Value".

(For all measurements, be sure to include the proper unit, and round all values to three significant digits.)

The measured value should be within 5% of Multisim's predicted value. Compute and record the percentage error by using the formula

$$\text{Percentage error} = \left| \frac{\text{Predicted value - Measured value}}{\text{Predicted value}} \right| \times 100$$

Explain why you might get a measured value greater than 5% ?

Task2 : Pass Grade – P1.2

(A) A technician in your company is working on a new project that needs conversions among number systems.
He approached you with the following questions:

1. Convert the following : 11011_2 and 0.1011_2 to decimal.

2. Convert 2714_{10} to binary.

3. Convert $1A4E_{16}$ into a denary number.

4. Convert 239_{10} into hexadecimal.

(B) A logic signal is required to give an indicator when:
(a) The supply to an oven is on , and
(b) The temperature of the oven exceeds 210 ^{0}C,or
(c) The temperature of the oven is less than 190 ^{0}C

Devise a logic circuit using **nand**-gates only to meet the requirements.

Task3 : Pass Grade – P1.3

The development department is conducting an experiment on a new device. They forward to you the following problems:

1. If $Z = R + j\omega L + \frac{1}{j\omega C}$, express Z in the form $a + jb$ when R = 10 , L = 5 C = 0.04 and $\omega = 4$

2. Given the following complex numbers :

   $Z_1 = 1 + 2j$, $Z_2 = 4 - 3j$, $Z_3 = -2 + 3j$, $Z_4 = -5 - j$

   Evaluate $\frac{Z_1 Z_3}{Z_1 + Z_4}$ in both the form ***a + bj*** and the polar form correct to 2 Significant figures. Show the result on an Argand diagram.

Task4 : Pass Grade – P1.4

The research department sent you the following problem:

Consider the complex number : $Z = 3.2 - 4.8j$

Determine in both polar and Cartesian forms

1. Z^5
2. The two square roots of Z .

Task4 : Pass Grade – P1.5

A technician in your company is facing the problem of representing complex impedances he wants from you to show him how to get results in both polar and rectangular form by solving the following problem:

Determine the current flowing in the load, Z_L , in the circuit shown in the following figure. Express your answer in both polar and rectangular form: