Experiement No : 3
Experiment Name : Use of potential transformer and current transformer.

Theory :

Potential transformer :

The potential transformer may be defined as an instrument transformer used for the transformation of voltage from a higher value to the lower value. This transformer step down the voltage to a safe limit value which can be easily measured by the ordinary low voltage instrument like a voltmeter, wattmeter and watt-hour meters, etc.

construction of potential transformer :

The potential transformer is made with high-quality core operating at low flux density so that the magnetising current is small. The terminal of the transformer should be designed so that the variation of the voltage ratio with load is minimum and the phase shift between the input and output voltage is also minimum.

The primary winding has a large number of turns, and the secondary winding has a much small number of turns. For reducing the leakage reactance, the co-axial winding is used in the potential transformer. The insulation cost is also reduced by dividing the primary winding into the sections which reduced the insulation between the layers.

Current Transformer :

The secondary winding however, may have a large number of coil turns wound on a laminated core of low-loss magnetic material. This core has a large cross-sectional area so that the magnetic flux density created is low using much smaller cross-sectional area wire, depending upon how much the current must be stepped down as it tries to output a constant current, independent of the connected load.

The secondary winding will supply a current into either a short circuit, in the form of an ammeter, or into a resistive load until the voltage induced in the secondary is big enough to saturate the core or cause failure from excessive voltage breakdown.

Unlike a voltage transformer, the primary current of a current transformer is not dependent of the secondary load current but instead is controlled by an external load. The secondary current is usually rated at a standard 1 Ampere or 5 Amperes for larger primary current ratings.

Current transformers can reduce or "step-down" current levels from thousands of amperes down to a standard output of a known ratio to either 5 Amps or 1 Amp for normal operation. Thus, small and accurate instruments and control devices can be used with CT's because they are insulated away from any high-voltage power lines. There are a variety of metering applications and uses for current transformers such as with Wattmeter's, power factor meters, watt-hour meters, protective relays, or as trip coils in magnetic circuit breakers, or MCB's.

Most current transformers have a the standard secondary rating of 5 amps with the primary and secondary currents being expressed as a ratio such as 100/5. This means that the primary current is 20 times greater than the secondary current so when 100 amps is flowing in the primary conductor it will result in 5 amps flowing in the secondary winding. A current transformer of say 500/5, will produce 5 amps in the secondary for 500 amps in the primary conductor, 100 times greater.
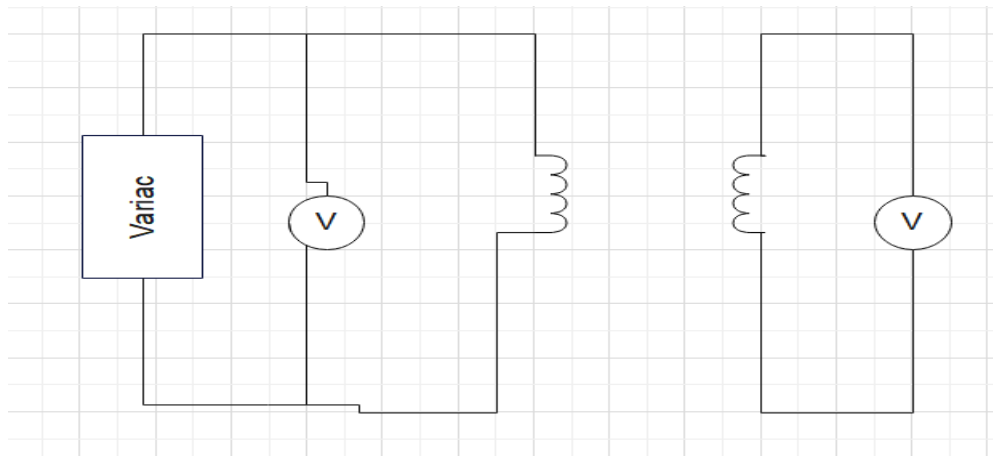
Circuit Diagram :
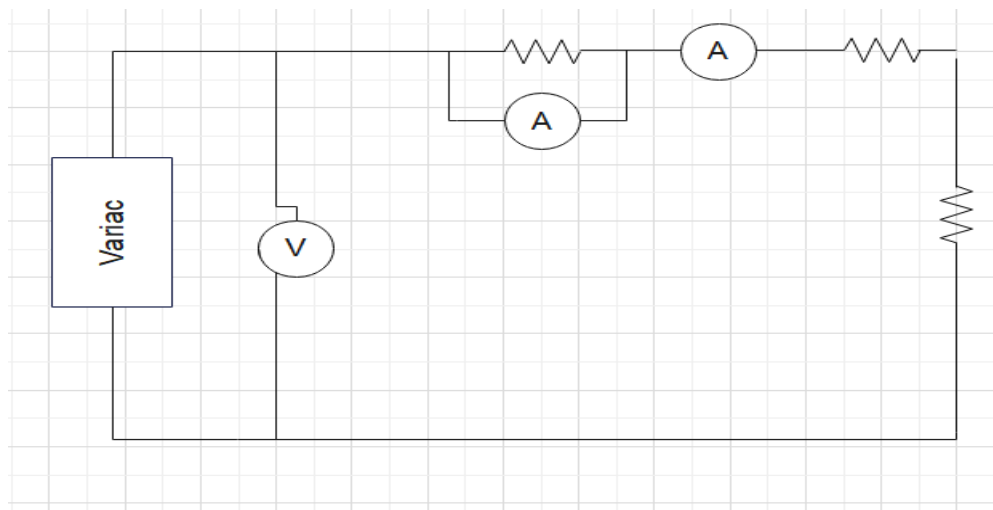

Figure 3.1 : Potential Transformer

Figure 3.2 : Current Transformer.

Required Apparatus :

SI No	Apparatus Name	No
1.	CT	1
2.	PT	1
3.	Ammeter	3
4.	Voltmeter	3
5.	Variac	1
6.	AC supply	1
7.	Wires	

Data Table :

SI No	V_p	V_s	I_p	I_s	Turn Ratio (P.T)			Turn Ratio (C.T)		
					Reading	Measured	Error	Reading	Measured	Error
1.	100.5	50.2			0.499	0.5	0.2			
2.	150.4	75.1			0.499	0.5	0.2			
3.	200.6	100.2			0.4895	0.5	0.1			
4.			6	0.72				0.12	1/8	4.9
5.			8	0.97				0.12125	1/8	3
6.			9	1.12				0.124	1/8	0.88

Discussion :

In this experiment we measured the turn ratio of potential and current transformer. We measured the turn ratio and compared with the reading value. The measured value was very close to the reading value. We measured for 3 different input values, and figured out that turn ratio does not change that much. The error in case of P.T were 0.2,0.2 and 0.1 percent. And in case of C.T the error were 4.9 , 3 and 0.88 percent.

Conclusion :

The experiment was done very properly. The wires were connected carefully. The readings were taken correctly. The result of this experiment was correct.
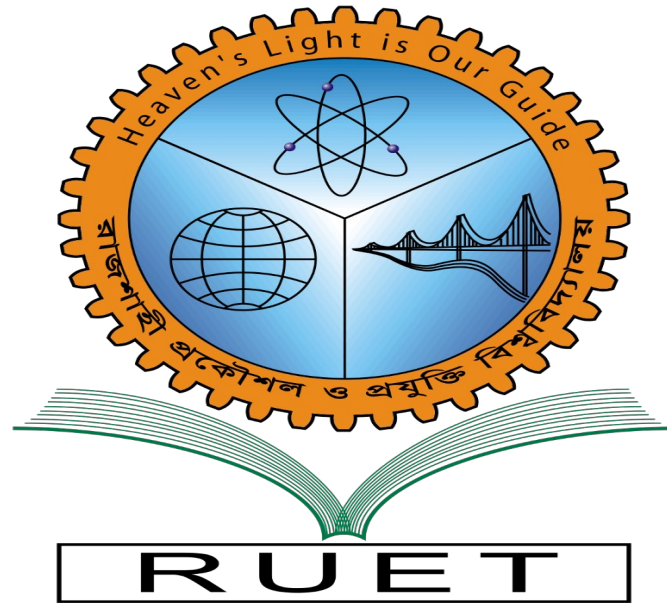
Department of Electrical and Computer Engineering

Course No : ECE 3220

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Submitted To :

Oishi Joyoti

Lecturer

Dept of ECE, RUET

Submitted By:

Tamim Hasan

Roll : 1810044

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