Reciprocity Theorem

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Objective: Verification of Reciprocity Theorem.

1 Theory

Consider 2-Port (4-terminal) linear bilateral passive networks as shown in Figures 1 and 2. Apply a voltage V_S across terminals $1-1'$ and I_3 flows through the ammeter connecting terminals $2-2'$. Next interchange the positions of the ammeter and the source voltage. The magnitude of the source voltage in this new position is set to V_s'. Measure the corresponding current I_1'. The reciprocity theorem states that for passive bilateral network,

$$\frac{V_S}{I_3} = \frac{V_S'}{I_1'}. \tag{1}$$

2 Procedure

Connect the resistive network as given in Figure 1. Apply 220V, single phase phase 50 Hz AC voltage at $1-1'$ and measure the ammeter current I_3 through $2-2'$. Check the ratio V_S/I_3. Now apply the AC voltage across $2-2'$ with $V_s' = 110$ V as in Figure 2 and measure the current I_1' through $1-1'$ by ammeter. Find the ratio V_S'/I_1'. These two ratios should be identical and calculate branch currents and node voltages for the two circuit configurations.

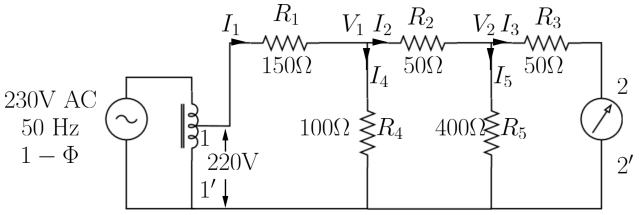

Figure 1: Circuit 1.

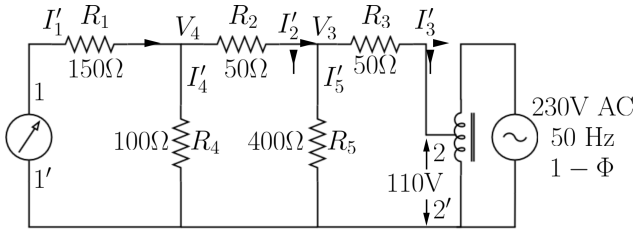

Figure 2: Circuit 2.

Enter the data in the following table:

V_S	I_3	V_S/I_3	$V_{S'}$	$I_{1'}$	$V_{S'}/I_{1'}$

Table 1: Experiment observation table.