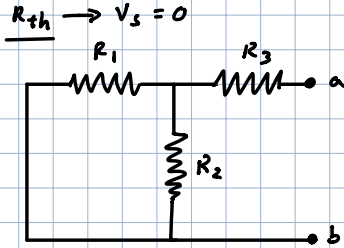
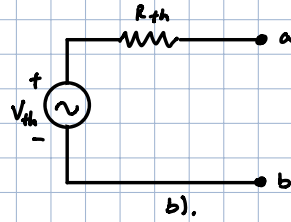
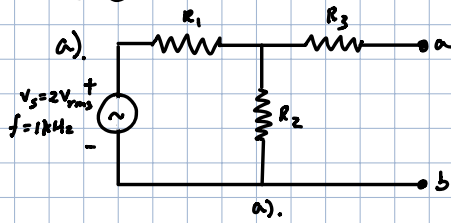


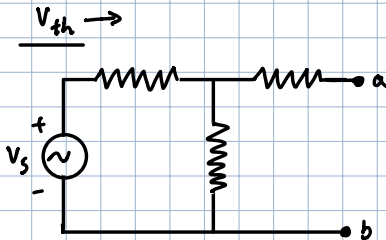
Lab 2:
Pre-Lab

Students: Jing Ma, Nelson Cortes,
Muhammed Erkol

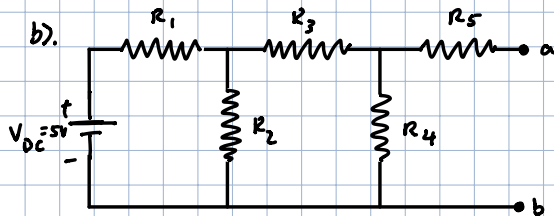


$$R_{th} = (R_1 \parallel R_2) + R_3$$

$$R_{th} = \frac{R_1 R_2}{R_1 + R_2} + R_3 = \frac{R_1 R_2 + R_3 (R_1 + R_2)}{R_1 + R_2}$$

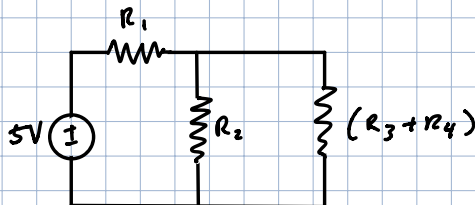


$$V_{th} = \frac{V_s R_2}{R_1 + R_2}$$



$$V_{DC} = 0 \rightarrow R_{th} = ((R_1 \parallel R_2) + R_3) \parallel R_4 + R_5$$

$$R_{th} = \frac{R_1 R_2 R_4 + (R_1 + R_2) R_3 R_4 + R_5 (R_1 R_2 + (R_1 + R_2) (R_3 + R_4))}{R_1 R_5 + (R_1 + R_2) (R_3 + R_4)}$$



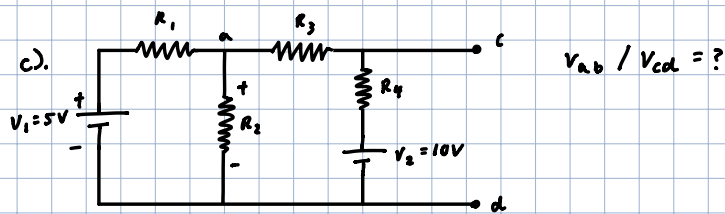
$$R_2 = \frac{5 (R_2 \parallel (R_3 + R_4))}{R_1 + (R_2 \parallel (R_3 + R_4))} = \frac{5 \left(\frac{R_2 (R_3 + R_4)}{R_2 + R_3 + R_4} \right)}{R_1 + \frac{R_2 (R_3 + R_4)}{R_2 + R_3 + R_4}}$$

$$V_{R_2} = \frac{5 R_2 (R_3 + R_4)}{R_1 (R_2 + R_3 + R_4) + R_2 (R_3 + R_4)}$$

$$R_4 = V_{R_2} \left[\frac{R_4}{R_5 + R_4} \right] = \frac{5 R_2 (R_3 + R_4)}{R_1 (R_2 + R_3 + R_4) + R_2 (R_3 + R_4)} \times \frac{R_4}{R_5 + R_4}$$

V_{th} = drop across R_4

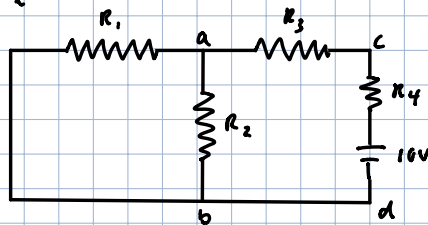
$$V_{th} = \frac{5 R_2 R_4}{R_1 (R_2 + R_3 + R_4) + R_2 (R_3 + R_4)}$$



$$V_{ab1} = \left(\frac{R_2 \parallel (R_3 + R_4)}{R_2 \parallel (R_3 + R_4) + R_1} \right) 5V$$

$$V_{cd1} = \left(\frac{R_4}{R_4 + R_3} \right) V_{ab1} = \left(\frac{R_4}{R_4 + R_3} \right) \left[\left(\frac{R_2 \parallel (R_3 + R_4)}{R_2 \parallel (R_3 + R_4) + R_1} \right) 5V \right]$$

$$V_2 = 10V$$

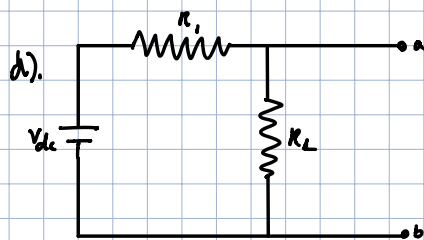


$$V_{ab2} = \left(\frac{R_1 \parallel R_2}{R_1 \parallel R_2 + R_3 + R_4} \right) 10V$$

$$V_{cd2} = \left(\frac{R_5 + (R_1 \parallel R_2)}{R_3 + R_1 \parallel R_2 + R_4} \right) 10V$$

$$\rightarrow V_{ab} = V_{ab1} + V_{ab2} = \left(\frac{R_2 \parallel (R_3 + R_4)}{R_2 \parallel (R_3 + R_4) + R_1} \right) 5V + \left(\frac{R_1 \parallel R_2}{R_1 \parallel R_2 + R_3 + R_4} \right) 10V$$

$$\rightarrow V_{cd} = V_{cd1} + V_{cd2} = \left(\frac{R_4}{R_4 + R_3} \right) \left[\left(\frac{R_2 \parallel (R_3 + R_4)}{R_2 \parallel (R_3 + R_4) + R_1} \right) 5V \right] + \left(\frac{R_5 + (R_1 \parallel R_2)}{R_3 + R_1 \parallel R_2 + R_4} \right) 10V$$



$$P_{R_L} = \frac{\left(\left(\frac{R_L}{R_L + R_1} \right) (V_{dc}) \right)^2}{R_L}$$

$$R_L = R$$

$$P_{max} = \frac{V_{dc}^2}{4R_L}$$