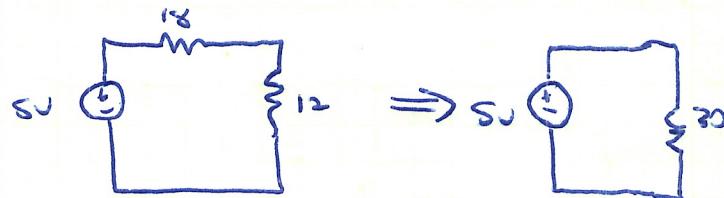
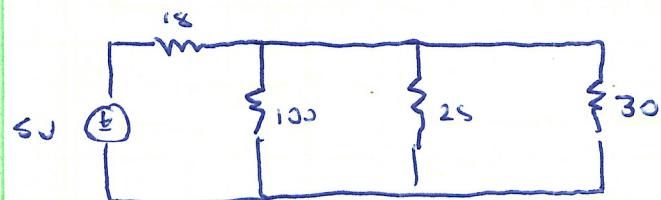
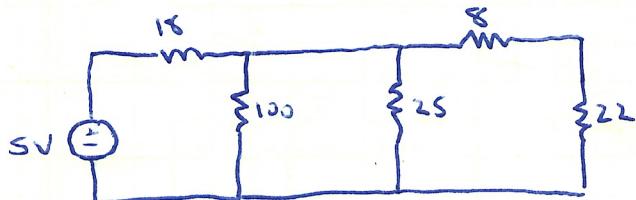
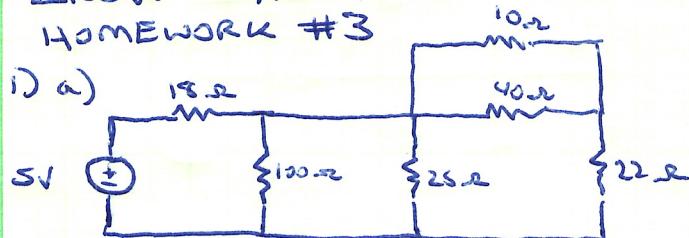


ENGR 2910 - 101
HOMEWORK #3

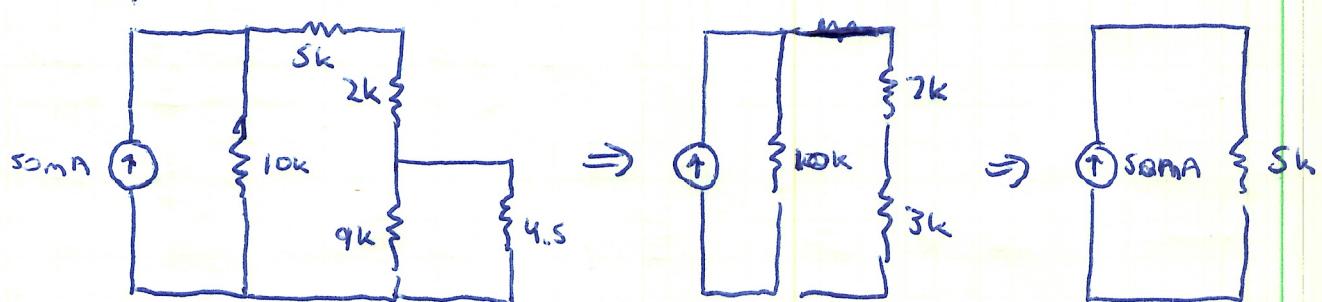
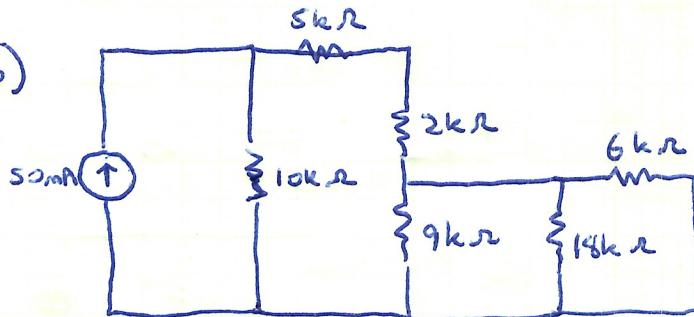
1) a)



$$R_{EQ} = 30\Omega$$

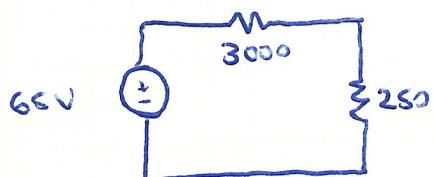
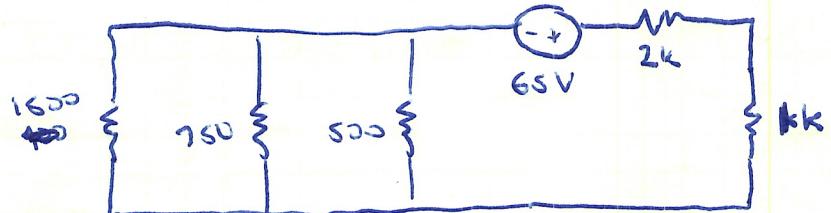
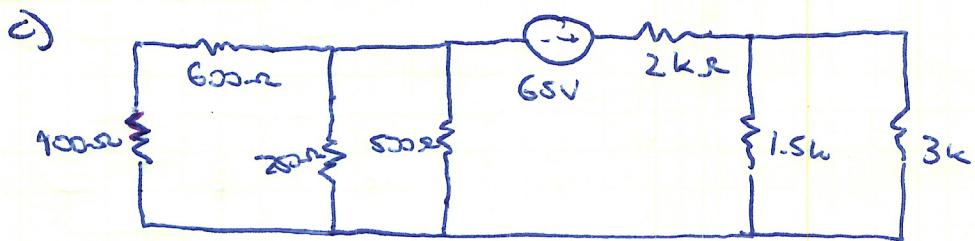
$$P = \frac{V^2}{R} = \frac{25V^2}{30\Omega} = 0.83W$$

b)



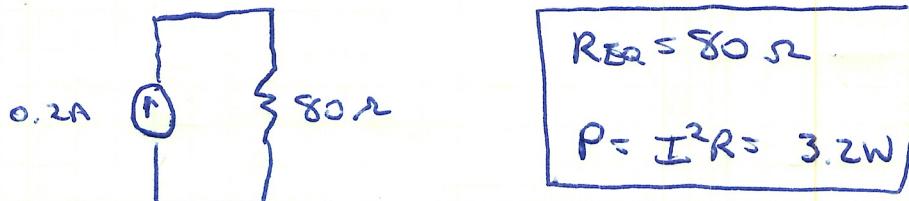
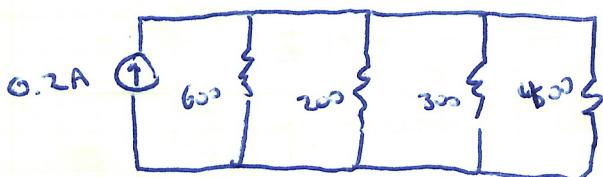
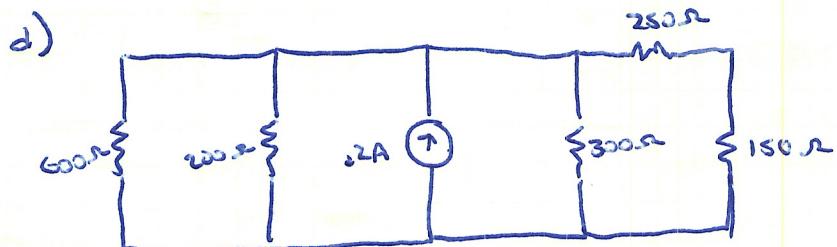
$$R_{EQ} = 5k\Omega$$

$$P = I^2 R = (0.05A)^2 (5000) = 12.5W$$



$$R_{EQ} = 3.25k\Omega$$

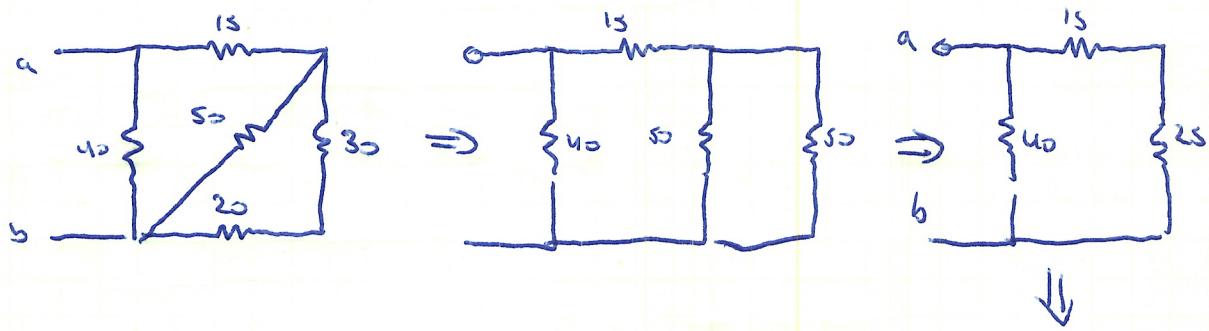
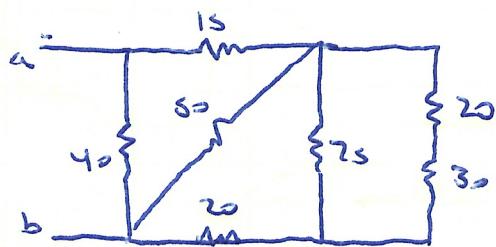
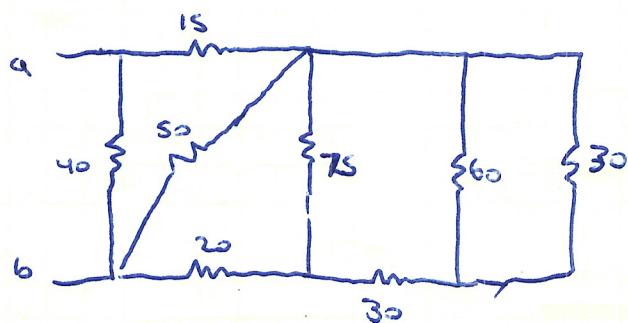
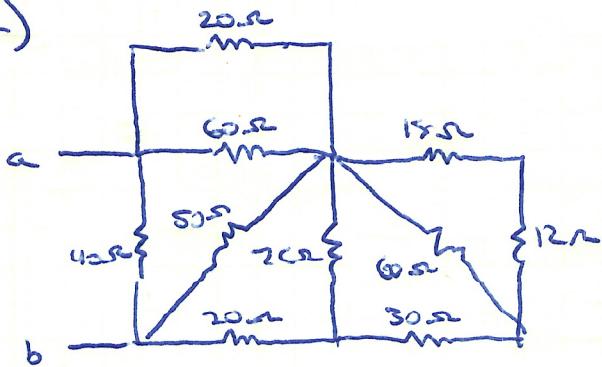
$$P = \frac{V^2}{R} = 1.3W$$



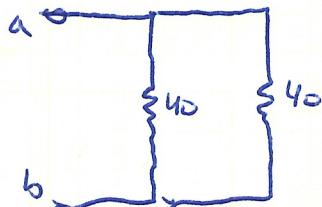
$$R_{EQ} = 80\Omega$$

$$P = I^2 R = 3.2W$$

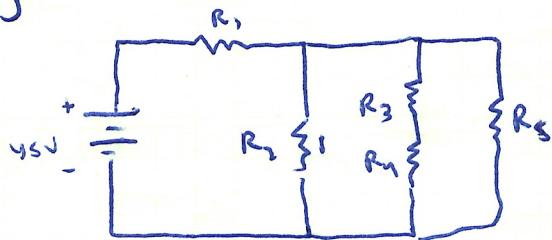
2)



$$R_{ab} = 20 \Omega$$



3)



$$R_{EQ} = R_1 + (R_2 \parallel (R_3 + R_4)) \parallel R_5$$

$$R_i = R$$

$$= R + (R \parallel R \parallel 2R)$$

$$= R + 0.4R$$

$$R = 1.4R$$

$$P = \frac{V^2}{R_{EQ}} \Rightarrow R_{EQ} = \frac{V^2}{P} = \frac{(45V)^2}{112W} = 18\Omega$$

$$1.4R = R_{EQ} = 18\Omega \Rightarrow$$

$$R = \frac{18\Omega}{1.4} = 12.9\Omega$$

$$4) a) V_o = \frac{R_2}{R_1 + R_2} V_{in}$$

$$= \frac{500}{2000 + 500} (75V)$$

$$= \frac{1}{5} (75V)$$

$$\boxed{V_o = 15V}$$

$$b) R_{EQ} = 2.5k$$

$$I = \frac{V}{R_{EQ}} = \frac{75V}{2.5k} = 30mA$$

$$P_{R_1} = I^2 R_1 = 1.8W$$

$$P_{R_2} = I^2 R_2 = 0.45W$$

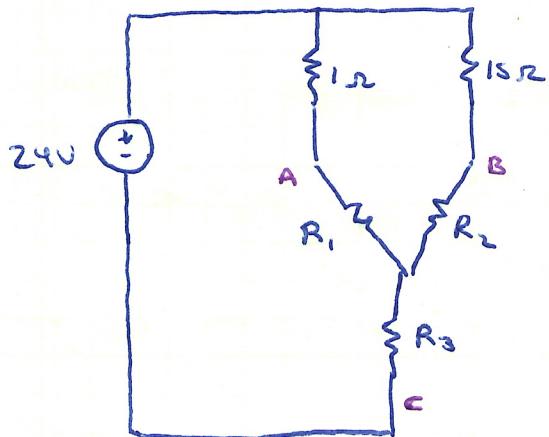
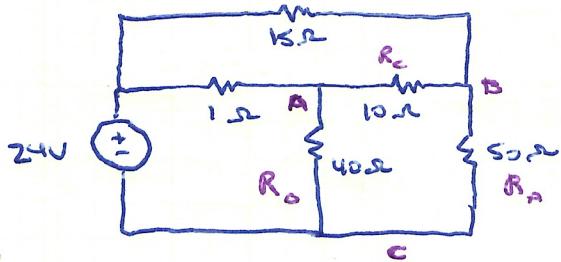
c) ~~WIR~~ ~~WIR~~ ~~WIR~~ ~~WIR~~

$$\text{In (a)}, V_{R_1} = (30mA)(2000\Omega) = 60V$$

$$P = \frac{V^2}{R} = 1 \Rightarrow R_1 = \frac{V^2}{1W} = \frac{3600V^2}{1W} = 3600\Omega$$

$$R_2 = \frac{1}{4} R_1 = 900\Omega$$

~~WIR~~

5) $\Delta \rightarrow Y$ 

$$R_1 = \frac{R_B R_C}{R_A + R_B + R_C} = \frac{400}{100} = 4\Omega$$

$$R_2 = \frac{R_A R_C}{R_A + R_B + R_C} = \frac{500}{100} = 5\Omega$$

$$R_3 = \frac{R_A R_B}{R_A + R_B + R_C} = \frac{2000}{100} = 20\Omega$$

$$\begin{aligned} R_{EQ} &= [(1+4) \parallel (15+5)] + 20 \\ &= (5 \parallel 20) + 20 \\ &= 24\Omega \end{aligned}$$

$$I = \frac{V}{R_{EQ}} = 1A$$

$$V_{R_3} = (1A)(20\Omega) = 20V$$

$$\text{KVL: } V_{(1\Omega + R_1)} = 4V$$

$$\Rightarrow I_1 = \frac{4V}{5\Omega} = 0.8A$$

$$V_{R_1} = 3.2V$$

$$V_{15\Omega + R_C} = 4V$$

$$I_L = \frac{4V}{20\Omega} = 0.2A$$

$$V_{R_2} = 1V$$

$$V_i = V_{AC} = 3.2V + 20V = 23.2V$$

$$V_o = V_{BC} = 1V + 20V = 21V$$