

P-2.13 a)

$$20i_a = 80i_b$$

$$i_g = i_a + i_b = 5i_b$$

$$i_a = 4i_b \text{ has been used.}$$

$$50 = 4i_g + 80i_b = 20i_b + 80i_b = 100i_b$$

$$\therefore i_b = 0.5 \text{ A and } i_a = 2 \text{ A.}$$



$$b) i_b = 0.5 \text{ A}$$

$$c) v_o = 80i_b = 40 \text{ V}$$

$$d) P_{4\Omega} = i_g^2(4) = 25 \text{ W}$$

$$P_{20\Omega} = i_a^2(20) = 80 \text{ W}$$

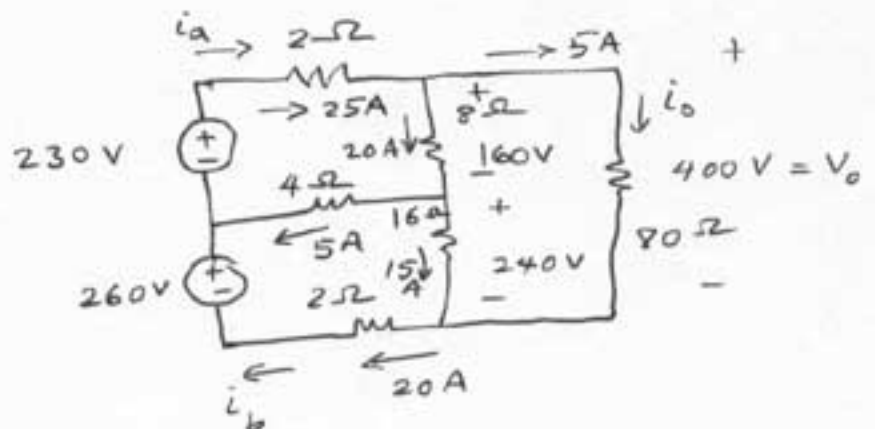
$$P_{80\Omega} = i_b^2(80) = 20 \text{ W}$$

$$e) P_{5V} (\text{delivered}) = 5i_g = 125 \text{ W}$$

$$\text{Check } \sum P_{dis} = 25 + 80 + 20 = 125 \text{ W}$$

$$\sum P_{del} = 125 \text{ W}$$

P-2.14 a)



$$V_e = 20(8) + 16(15) = 400 \text{ V}$$

$$i_e = \frac{400}{80} = 5 \text{ A}$$

$$i_a = 25 \text{ A}$$

$$P_{230\text{V}}(\text{supplied}) = 230(25) = 5750 \text{ W}$$

$$i_b = 5 + 15 = 20 \text{ A}$$

$$P_{260\text{V}}(\text{supplied}) = 260(20) = 5200 \text{ W}$$

$$b) \sum P_{\text{dis}} = (25)^2(2) + (20)^2(8) + (5)^2(4) + (15)^2(16) + (20)^2(2) + (5)^2(80) = 10,950 \text{ W}$$

$$\sum P_{\text{sup}} = 5750 + 5200 = 10,950 \text{ W}$$

P- 2.21 a)

$$V_b = 5(20 + 12) = 160 \text{ V}$$

$$V_b + V_a = 250 \text{ V} \Rightarrow V_a = 90 \text{ V}$$

$$i_b = 90 / (20 + 10) = 3 \text{ A}$$

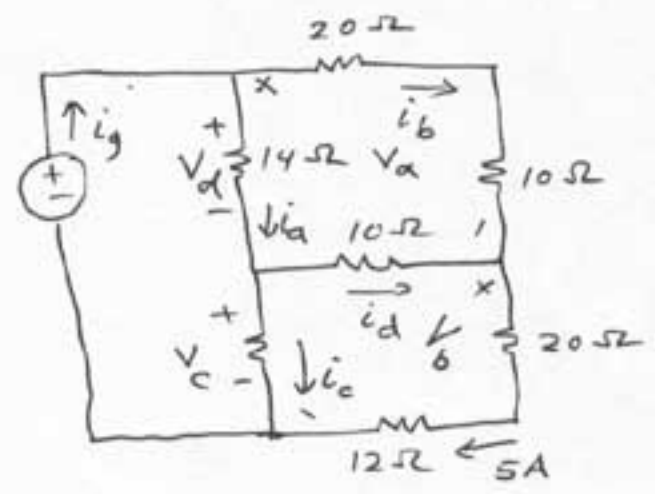
$$i_d = 5 - i_b = 2 \text{ A}$$

$$V_c = V_b + 10i_d = 180 \text{ V}$$

$$V_d = 250 - V_c = 70 \text{ V} = 14i_a \Rightarrow i_a = 5 \text{ A}$$

$$i_c = i_a - i_d = 5 - 2 = 3 \text{ A}$$

$$R = V_c / i_c = 180 / 3 = 60 \Omega$$



$$b) i_g = 5 + 3 = 8 \text{ A}$$

$$P_g(\text{sup}) = 250(8) = 2000 \text{ W}$$

P2 - 25 a)

$$15 \cdot 2 = 10i_{\beta} - 0.8 + 0.2(30i_{\beta})$$

$$16 = 16i_{\beta} \Rightarrow i_{\beta} = 1 \text{ mA}$$

$$0.2(30i_{\beta}) + v_y + 0.5(29i_{\beta}) - 25 = 0$$

$$v_y = 25 - 6i_{\beta} - 14.5i_{\beta}$$

$$\therefore v_y = 4.5 \text{ V}$$

$$b) \sum P_{\text{gen}} = 15 \cdot 2 i_{\beta} + 25(29)i_{\beta} + 0.8i_{\beta} = 741i_{\beta} = 741 \text{ mW}$$

$$\begin{aligned} \sum P_{\text{dis}} &= 10^4(i_{\beta})^2 + 200(30i_{\beta})^2 + 29i_{\beta}(4.5) \\ &\quad + 500(29i_{\beta})^2 = 741 \text{ mW} \end{aligned}$$

P - 2.27 a)

$$12 - 2i_{\sigma} = 5i_{\Delta}$$

$$5i_{\Delta} = 8i_{\sigma} + 2i_{\sigma} = 10i_{\sigma}$$

$$\therefore 12 - 2i_{\sigma} = 10i_{\sigma} \Rightarrow i_{\sigma} = 1 \text{ A}$$

$$5i_{\Delta} = 10i_{\sigma} = 10 \Rightarrow i_{\Delta} = 2 \text{ A}$$

$$\therefore v_{\sigma} = 2i_{\sigma} = 2 \text{ V}$$

b)  $i_g$  = current out of the + terminal of the 12V source  
 $v_d$  = voltage drop across the  $8i_{\Delta}$  source.

$$i_g = i_{\Delta} + i_{\sigma} + 8i_{\Delta} = 9i_{\Delta} + i_{\sigma} = 19 \text{ A} \quad \leftarrow v_d = 2 + 8 = 10 \text{ V}$$

$$\sum P_{\text{gen}} = 12i_g + 8i_{\Delta}(8) = 12(19) + 8(2)(8) = 356 \text{ W}$$

$$\begin{aligned} \sum P_{\text{dis}} &= 2i_{\sigma}i_g + 5i_{\Delta}^2 + 8i_{\sigma}(i_{\sigma} + 8) + 2i_{\sigma}^2 + 8i_{\Delta}v_d \\ &= 2(1)(19) + 5(2)^2 + 8(1)(17) + 2(1)^2 + 8(2)(10) = 356 \text{ W} \end{aligned}$$