Solutions to Practice Problems

1, $I_x = (1mA)\left(\frac{2k}{2k+4k}\right)$, current divider

$= 1/3\ mA$

$AI_x = (6000)\left(\frac{1}{3}mA\right) = 2V$

$P_{Load} = V^2/R_L = \frac{(2)^2}{5k} = \boxed{0.8mW}$

2, using superposition :

- $V_{out_1} = -\frac{R_2}{R_1}(V_1)$, V_2 turns off
- $V_{out_2} = \left(1+\frac{R_2}{R_1}\right)\left(\frac{R_4}{R_4+R_3}\right)(V_2)$, V_1 turns off.

voltage divider to obtain V^+

$$\boxed{V_{out} = -\frac{R_2}{R_1}V_1 + \left(1+\frac{R_2}{R_1}\right)\left(\frac{R_4}{R_4+R_3}\right)(V_2)}$$

3, - $V_{out_A} = -\frac{R_2}{R_1}(V_A)\left(1+\frac{R_4}{R_3}\right)$

- $V_{out_B} = \left(1+\frac{R_2}{R_1}\right)\left(1+\frac{R_4}{R_3}\right)(V_B)$

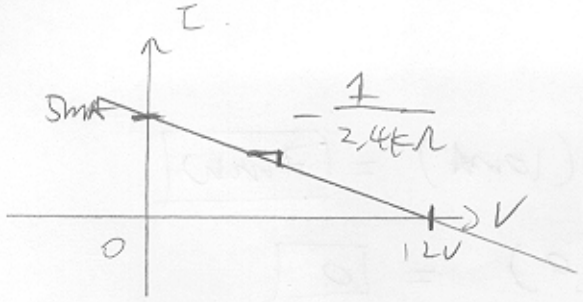
$$\boxed{V_{out} = \left(1+\frac{R_4}{R_3}\right)\left(-\frac{R_2}{R_1}V_A + \left(1+\frac{R_2}{R_1}\right)(V_B)\right)}$$

4, $V_x = (5V)\left(\frac{6k//6k}{6k//6k+2k}\right)$, voltage divider

$= 3V$

Thevenin eq.

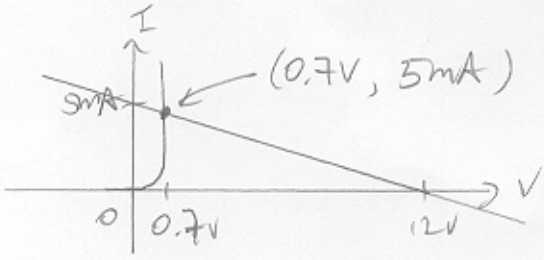
4 (cont.)



$V_{OC} = 12V$

$I_{SC} = 12V / 2.4k = 5mA$

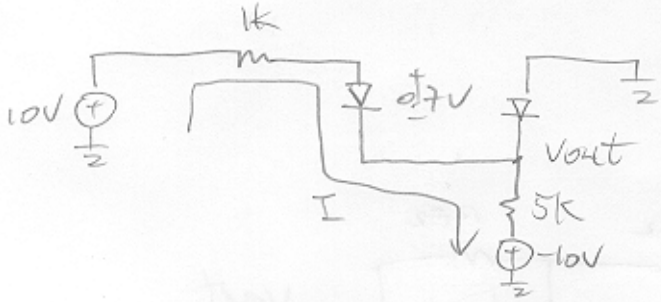
5,



$I \sim 5mA$ (a little less than 5mA)

$V = 0.7V$

6a,



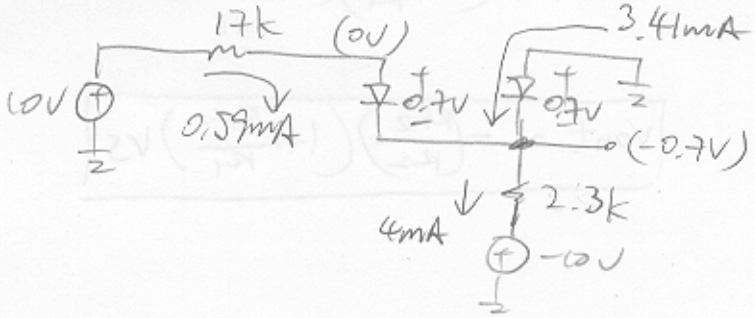
$I = \frac{10 + 10 - 0.7}{1k + 5k} = 3.2mA$

$V_{out} = I(5k) - 10V$

$= \boxed{6V}$

b, D1 & D2 on, $\boxed{V_{out} = -0.7V}$

to check:



7a, D1 ~~off~~ on, D2 on

$\boxed{V_{out} = +0.7V}$

b, D1 on, D2 off.

$V_{out} = IR_2 - 10V$, $I = \frac{10 + 10 - 0.7}{17k + 2.3k} = 1mA$

$= (1mA)(2.3k) - 10V = \boxed{-7.7V}$

8, D_1 on , D_2 off.

$P_{D1} = (V_{D1})(I_{D1}) = (0.7V)(10mA) = \boxed{7mW}$

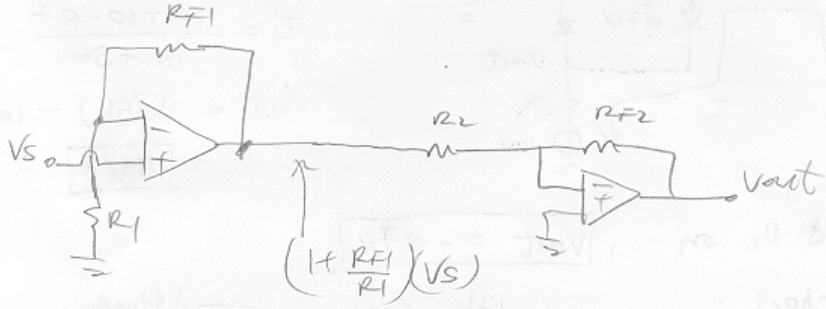
$P_{D2} = (V_{D2})(I_{D2}) = (V_{D2})(0) = \boxed{0}$

9, D_2 on , D_1 off

$P_{D2} = \boxed{7mW}$

$P_{D1} = \boxed{0}$

10,



$$\boxed{V_{out} = -\left(\frac{RF2}{R2}\right)\left(1+\frac{RF1}{R1}\right)Vs}$$