Solution for LAB 2 P1

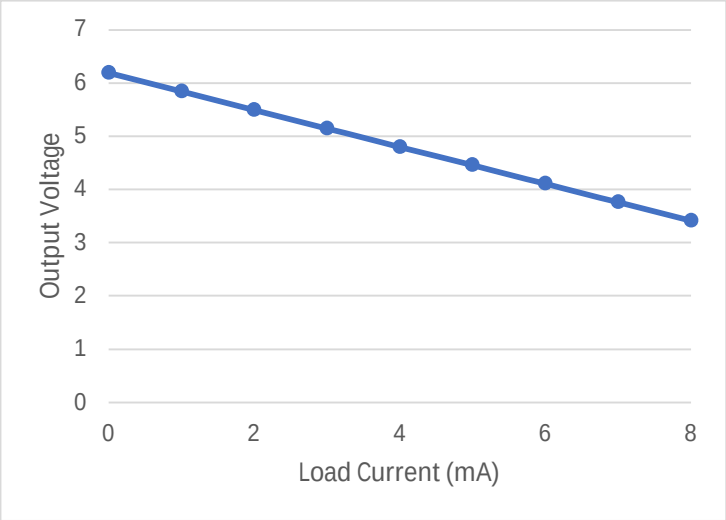
APPLY Nodal Analysis @ V_o

$$\frac{V_o - V_{cc}}{R_1} + \frac{V_o}{R_2} + I_L = 0$$

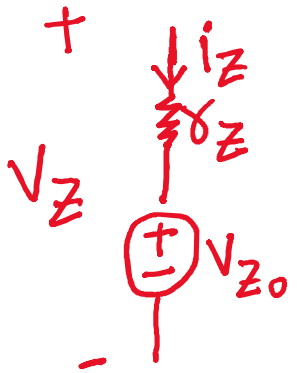
$$V_o = \frac{R_1 R_2}{R_1 + R_2}\left[\frac{V_{cc}}{R_1} - I_L\right]$$

Using above equation, we will get following values of V0

iL(mA)	0	1	2	3	4	5	6	7	8
Vo (V)	6.19	5.84	5.50	5.15	4.80	4.46	4.11	3.76	3.42



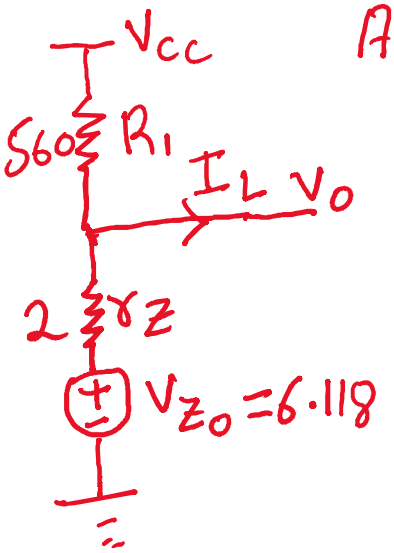
Solution for LAB 2 P2



$$V_Z = V_{Z_0} + i_Z \gamma_Z$$

$V_Z = 6.2V$ for $I_Z = 41mA$ & $\gamma_Z = 2\Omega$

$$\Rightarrow V_{Z_0} = 6.118V$$



APPLY Nodal Analysis @ V_o

$$\frac{V_o - V_{CC}}{R_1} + \frac{V_o - V_{Z_0}}{\gamma_Z} + I_L = 0$$

$$\Rightarrow \boxed{V_o = \frac{V_{CC}\gamma_Z + V_{Z_0}R_1 - I_L R_1 \gamma_Z}{R_1 + \gamma_Z}}$$

↳ EQ 1

EQ 1 is Valid only if

$I_Z \geq I_{ZK}$ $\quad \because I_{ZK} = 1mA$

$$\frac{V_o - V_{Z_0}}{\gamma_Z} \geq I_{ZK}$$

$$\Rightarrow V_o \geq 6.12V$$

or $I_L \leq 6.93mA \quad \because I_L = \frac{V_{CC} - V_o}{R_1}$

For $I_L > 6.93mA$: Zener diode will be reversed Biased

$$\boxed{V_o = V_{CC} - I_L R_1} \rightarrow \text{EQ 2}$$

Using EQ1 & EQ2, we will get following values of V0

iL(mA)	0	1	2	3	4	5	6	7	8
Vo (V)	6.132	6.130	6.128	6.126	6.124	6.122	6.120	6.08	5.52