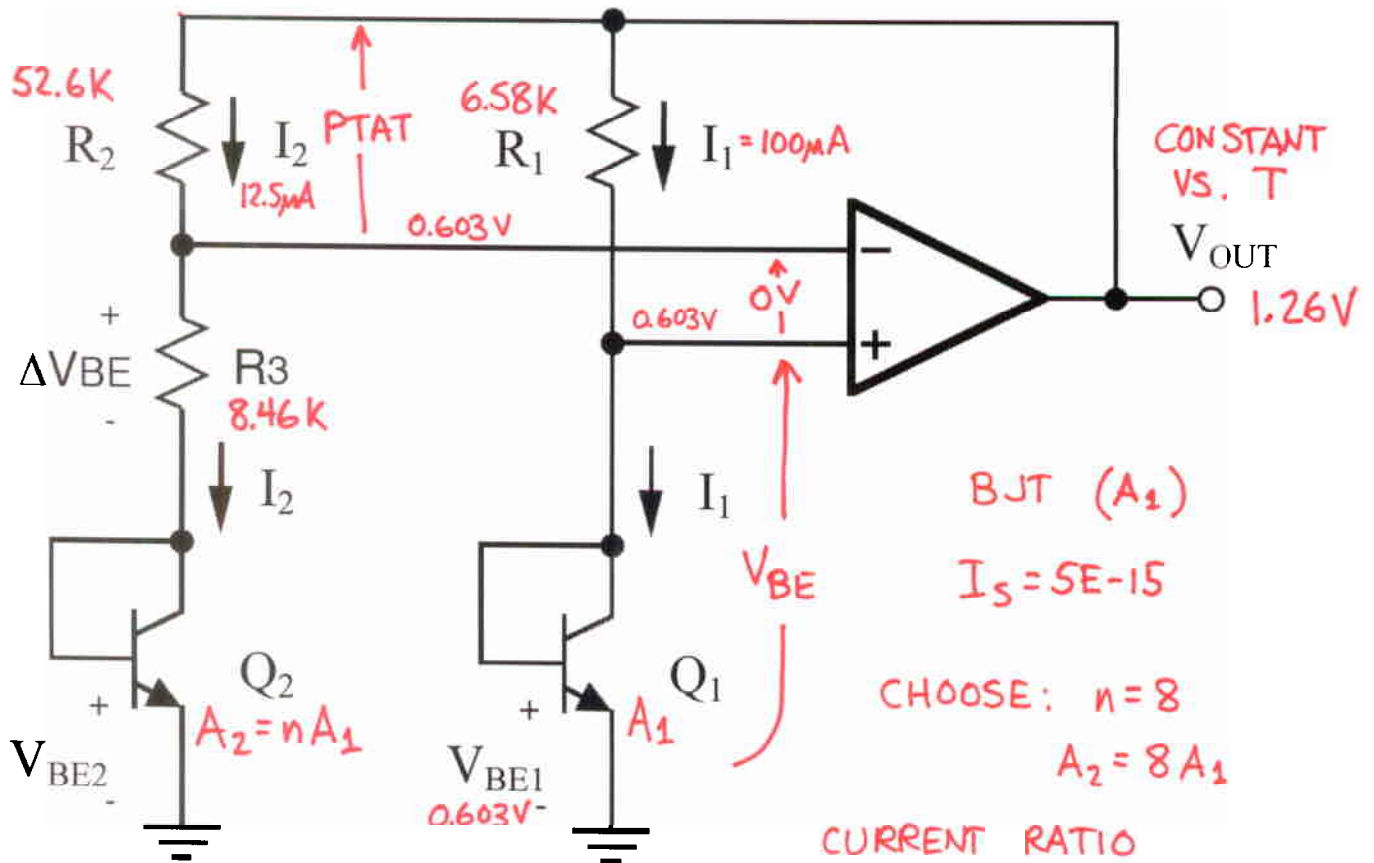


(i) STARTUP



CURRENT RATIO

$$\frac{I_1}{I_2} = 8 = \frac{100\mu A}{12.5\mu A}$$

$$V_{BE1} = \frac{kT}{q} \ln \left( \frac{100\mu A}{5E-15} \right) = 0.603V$$

$$R_1 \Rightarrow \frac{1.26V - 0.603V}{100\mu A} = 6.58K\Omega \Rightarrow R_2 = 8R_1 = 52.6K\Omega$$

8X FOR  $R_2$   
(CURRENT RATIO)

$R_3$ : NEED "JUST RIGHT AMOUNT OF PTAT"

$$V_{OUT} = 1.26V = \underbrace{V_{BE1}}_{0.603} + \underbrace{\frac{kT}{q}}_{0.0254} \left[ \underbrace{\frac{52.6K\Omega}{R_3}}_{6.22} \ln \left( \underbrace{8}_{\frac{R_2}{R_1}} \cdot \underbrace{8}_{\frac{A_2}{A_1}} \right) \right]$$

25.9

$$\Rightarrow R_3 = 8.46K\Omega$$