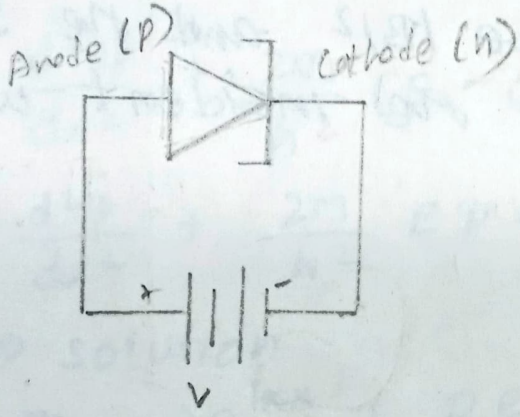
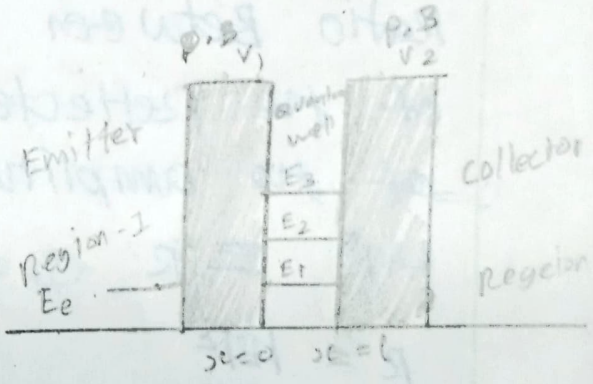
07-12-23

Resonant Tonneling Diode

Day 62





Doping Ratio :

$1 : 10^4$

Si P

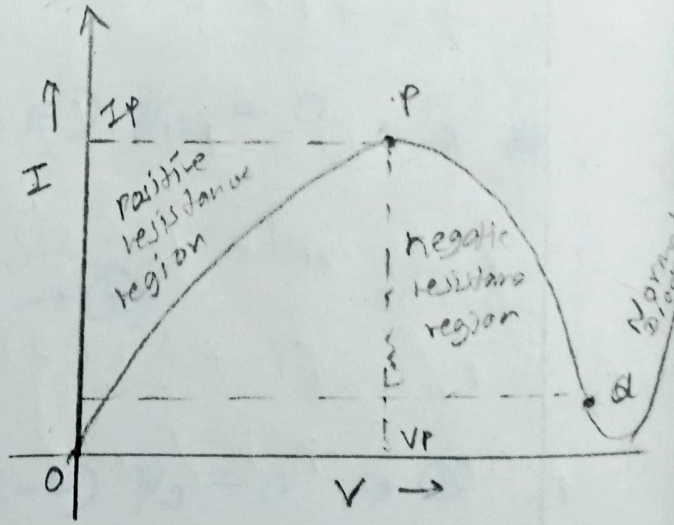
$E_e \approx E_1$

$E_1 = E_1$

a) $E_1 > E_e$, $E_e = E_2$

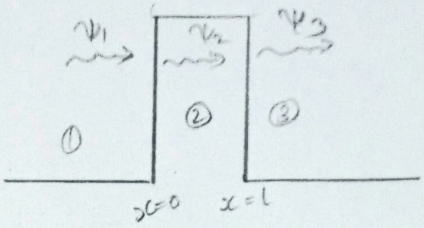
b) $E_2 < E_e$

$T_I = I_T + I_P + I_{Excess\ current.}$



Finite potential well

$$\frac{d^2\psi_2}{dx^2} + \frac{2m}{\hbar^2}(E-V)\psi = 0$$



let, $\frac{2m}{\hbar^2}(V-E) = k^2$

$$\frac{d^2\psi_2}{dx^2} + k^2\psi = 0$$

i) $x < 0$ [Region 1]
ii) $x > L$ [Region 3]

① $\psi_3 = De^{-kx}$

② $\frac{d^2\psi_2}{dx^2} + \frac{2m}{\hbar^2}E\psi = 0$

$$\psi_2 = F\sin\frac{\sqrt{2mE}}{\hbar}x + G\cos\frac{\sqrt{2mE}}{\hbar}x$$

- $G\left[k\cos\frac{\sqrt{2mE}}{\hbar}L - \frac{\sqrt{2mE}}{\hbar}\sin\frac{\sqrt{2mE}}{\hbar}L\right] = kDe^{-kL}$
- $\tan\frac{\sqrt{2mE}}{\hbar}L = \frac{2\sqrt{E(V-E)}}{2E-V}$