MWOC

Tutorial-2.

18ECR043

1)

$$\sigma = e(\mu_e n_e + \mu_h n_h)$$

$$= 1.6\times10^{-19}(8000\times10^{-4}\times10^{11} + 180\times10^{4}\times10^{14})$$

$$= 1.6\times10^{-19}\times 8000\times10^{-4}\times10^{11}$$

$$= 1.28 \text{ mmhos}.$$

2) Data:

Threshold field $E_{th} = 2800\ V/cm$.

Applied field $E = 3200\ V/cm$.

Device length $L = 10\mu m$

Doping concentration $n_0 = 2 \times 10^{14}\ cm^{-3}$

Operating frequency $f = 10GHz$.

a) The electron drift velocity,

$$v_d = 10 \times 10 \quad \times 10 \times 10^{-6}$$

$$\boxed{v_d = 10^5\ m/sec}$$

b) The current density:

$$J = qnV = 1.6 \times 10^{-19} \times 2 \times 10^{20} \times 10 \times 10^{9} \times 10^{-5}$$

$$= 3.2 \times 10^{6}\ A/m^2$$

$$= 320\ A/cm^2$$

c) Negative electron mobility is

$$\mu_n = -\frac{V_d}{E} = \frac{-10^7}{3200}$$

$$= -3100\ cm^2/V.sec$$