Numerical Based on Part-1 of notes & current electricity

(* This can be seen as question not of p-n junction, but as it is covered in lecture question is given)

Q You have been given a piece of wire of length 10 cm and area 1 mm^2 with electron density 10^{22} electrons/m^3. Resistivity of material of wire is 2×10^{-8} Ω-m. If voltage of 4.8 mV is applied, then find

(a) current in the wire

(b) drift velocity of electron.

Sol^n

$$R = \frac{\rho l}{A} = \frac{2 \times 10^{-8} \times 10^{-1}}{10^{-6}} = 2 \times 10^{-3} \,\Omega$$

$$I = \frac{V}{R} = \frac{4.8 \times 10^{-3}}{2 \times 10^{-3}} = 2.4 \text{ A}$$

$$I = ne A v_d$$

$$2.4 = 10^{22} \times 1.6 \times 10^{-19} \times 10^{-6} \times v_d$$

$$\frac{2.4 \times 10^3}{1.6} = v_d$$

$$v_d = 1500 \text{ m/s}$$