Assignment on solid state electronic devices

1. Determine the effective Richardson constant from the current-voltage characteristics.

   Consider the tungsten-silicon diode curve and assume a barrier height of ϕ_B = 0.67 V and $J_{sT} \approx 6 \times 10$ A/cm².

2. Calculate the ideal reverse-saturation current densities of a Schottky barrier diode and a pn junction diode.

   Consider a tungsten barrier on silicon with a measured barrier height of $e\phi_B$ = 0.67 eV. The effective Richardson constant is $A^* = 114\, A/K^2{-}cm^2$. Let T = 300 K.

3. Calculate the forward-bias voltage required to induce a forward-bias current density of 10 A/cm³ in a Schottky barrier diode and a pn junction diode. Consider diodes with the parameters given in question 2. We can assume that the pn junction diode will be sufficiently forward biased so that the ideal diffusion current will dominate. Let T = 300 K.

4. Calculate the effective Richardson constant of an electron.

5. Draw the energy band diagram of npn transitor under breakdown conditions.