GIVEN: $v_d = 1 \times 10^7$ cm/s $\rho = 5 \times 10^{15}/cm^3$

FIND: j^{MAX}

SOLN: $j = q \rho v_d = (1.6 \times 10^{-19})(5 \times 10^{15})(1 \times 10^7)$

$= 8 \ \frac{KA}{cm^2}$

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GIVEN: $I_S = 10^{-17}$ A $\quad n = 1.07$

FIND: A) v_D IF $I_D = 70\mu A$

B) v_D IF $I_D = 5\mu A$

C) i_D IF $v_D = 0V$

D) i_D IF $v_D = -0.075V$

E) i_D IF $v_D = -5V$

SOLN: A) $i_D = I_S\left(e^{v_D/nV_T} - 1\right)$ $\quad$ ASSUME $V_T = 25mV$

so, $v_D = nV_T \ln\left(1 + \frac{i_D}{I_S}\right)$

$v_D = 0.791V$

B) $v_D = 0.721V$

C) $i_D = 0$ A

D) $i_D = -9.4 \times 10^{-18}$ A

E) $i_D = -1 \times 10^{-17}$ A

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GIVEN: $10^{-14} \leq I_S \leq 10^{-12}$ A

FIND: RANGE OF v_D IF $i_D = 1mA$

SOLN: $v_D = n V_T \ln\left(1 + \frac{i_D}{I_S}\right)$ ASSUME $V_T = 25mV$ AND $n = 1$

SO IF I_S IS 10^{-14}...

$v_D = 0.633$ V

AND FOR I_S 10^{-12} ... $v_D = 0.518$ V

SO, $0.518 \leq v_D \leq 0.633$ V

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