19/7/2014

Sem III
Electronics

ED "work 01"

07/08/2015

1. for a Si pn junction at $T = 300K$, $N_a = N_d = 10^{17}/cm^3$, $D_n = 25 cm^2/s$, 6M $D_p = 15 cm^2/s$, $\tau_p = \tau_n = 50 ns$, Area $= 10^{-4}/cm^2$.
Find value of forward current for forward-bias of 0.7V

2. for a ntype semiconductor, Fermi-level is closer to _____. 1M

3. Breakdown voltage of a zener diode is decided by _____. 1M

4. Draw MCD for an npn BJT in forward active mode. 1M

5. An abrupt Si pn junction has $N_a = 10^{17}/cm^3$ on p side and $N_d = 10^{16}/cm^3$ on n-side at 300K.
a) Draw an equilibrium EBD and calculate positions of Fermi levels 10M
b) Find V_{bi} from the EBD in (a)
c) Compare the result from (a) with V_{bi} calculated from its formula

6. A Si pn junction has $V_{bi} = 0.65V$ and acceptor conc^n on p-side is 100 times greater than donor conc^n on n-side. Find the width of depletion region and value 6M of depletion capacitance per unit area. when a R.B voltage of 10V is applied across it.

7. Draw small signal model of pn junction and explain 5M significance of every model component in short. (A Line each)

8. State 4 ideal pn junction diode assumptions. 5M

9. Draw ideal and practical I-V characteristics of pn junction diode (State the various effects 10M responsible for deviation from ideal curve). (in short)

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10. Draw EBD of an npn BJT under
a) under equilibrium
10M b) Forward-active mode. (Mark all the details in EBD)

11. A Si npn BJT has $N_E = 5\times10^{18}/cm^3$ & $N_B = 5\times10^{16}/cm^3$ $V_{BE} = 0.6V$. and neutral emitter width is 3μm. Calculate
5M excess minimum carrier conc^n at emitter edge of B-E space-charge region.

12. Draw EBD of a Ge pn junction diode under
a) Thermal equilibrium
10M b) Forward bias
c) Reverse bias
(Mention all details and energy levels)

13. "Minority carrier distribution" decay exponentially with distance away from junction to their thermal-
10M equilibrium values"
Justify above statement. (can use eq^{n}s, few lines or diagm to explain it.)

14. Calculate built-in potential for an abrupt Si pn
20M junction with acceptor doping conc^n $10^{16}/cm^3$ and donor doping conc^n of $10^{16}/cm^3$.
Also, Find space-charge width, peak E-field, x_n & x_p
Hence, from above answer's sketch a) space-charge Vs x
b) E-field Vs x c) Potential variations Vs x
to scale. with proper values and relevant information.

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