COLLEGE OF ENGINEERING & TECHNOLOGY

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Course Title: Electronic Devices I
Course Code: EC 233

Cairo Branch

Sheet 8

## I. Indicate whether each of the following statements is true or false *(give reasons)*:

1- In a reverse biased pn-junction, the p-side is connected to a higher potential than the n-side.

2- In a reverse-biased pn- junction, the minority carrier concentration increase relative to their equilibrium values.

3- In a forward- biased pn- junction, the Quasi- Fermi level in the p-side is higher than that in the n-side.

4- In a pn-junction diode, the higher is the doping concentration, the higher is the reverse saturation current.

5- Under forward bias, a reduction in potential barrier is associated by an increasing diffusion current.

6- The drift of minority carriers through the depletion layer controls the reverse saturation current.

7- The junction capacitance of a pn- junction increases with increasing the width of the depletion layer.

II. Choose the correct answer justifying your choice:

1- The I-V characteristics of a pn-junction diode in the forward regime appear on a logarithmic scale as a straight line of slope ……………..

(a) Zero
(b) KT/q
(c) q/KT
(d) KT

1- Figure (1) is a dimensioned plot of the steady state carrier concentrations inside a p-n abrupt silicon junction diode maintained at room temperature. Use the data given in the figure to answer the following parts:
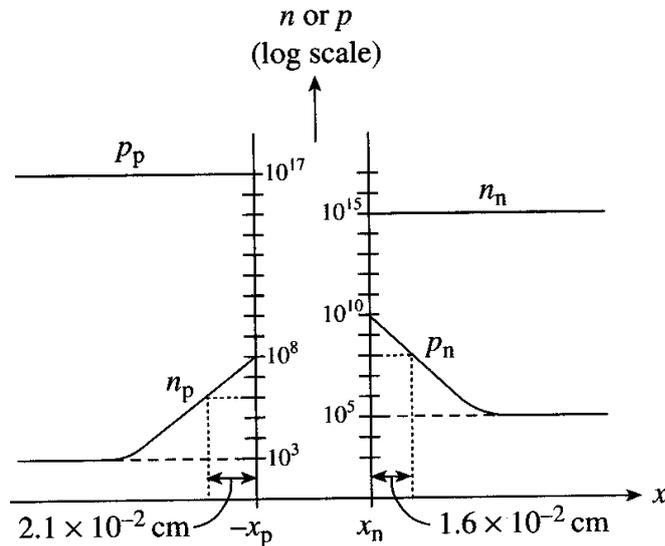
I.   What is the bias condition of the diode?

II.   Low- level injection conditions:

        (a) prevail only in the neutral p - region
        (b) prevail only in the neutral n - region
        (c) prevail in both the neutral p - and n- regions
        (d) do not prevail in any region

III.   Calculate the built in voltage of the diode?

IV.   Calculate the external applied voltage V?

2- A Si p^+-n junction has a donor doping of 5×10^{16} cm^{-3} on the n-side and a cross- sectional area of 10^{-3} cm^2. If $\tau_p = 1\mu s$ and $D_p = 10cm^2/s$, calculate the current with a forward bias of 0.5 V at 300k.

This work had been prepared with the help of Dr. Wael Fikry and Dr. Tarek Abd El_Kader.

Good Luck ☺