Started on	Friday, 17 September 2021, 4:00 PM
State	Finished
Completed on	Friday, 17 September 2021, 4:44 PM
Time taken	44 mins 40 secs
Grade	**6.00** out of 15.00 (**40**%)

Question **1**
Complete
Mark 2.00 out of 2.00

Recall the expressions of current gains α and β for a BJT and derive the relation between the two current gains. Write the detailed steps in the HTML editor provided.

w.k.t I_E =I_B+I_C, 1

and α =I_C/I_E and β = I_C/I_B . 2

dividing equation 1 by I_C on both sides,

I_E/I_C=I_B/I_C+1 , 3

Substituting values in 2 on eq 3,

1/α=1/β+1

after rearranging terms,

α=β/(1+β) or

β=α/(1-α).

Comment:

Question **2**
Complete
Mark 0.00 out of 6.00

Consider a Si n-channel MOSFET with gate oxide thickness = 100 Å and N_A = 10^{17}/cm^3 Calculate the following:

(a) voltage developed across semiconductor

(b) Width of depletion region

(c) Oxide capacitance

(d) Threshold voltage

(e) The voltage that should be applied at the gate to get a drain current of 1 mA assuming that the MOSFET is in saturation. Given that the surface mobility of electrons is 150 cm^2/V-s, Z=150µm and L=10µm.

Answer: b) 1.35*10^-5 cm c)7.73*10^-2 microfarads

Question **3**
Not answered
Marked out of 3.00

A MOS capacitor is made with n^+ poly Si gate. The carrier density of the p-type Si substrate is 2X10^{16}/cm^3, and the oxide region thickness is 80 nm. Find the flat band voltage of the device if the oxide charge density is 2X10^{-8} C/cm^2, Φ_{MS} = −0.90 V and ε_{SiO2}=3.9.

Answer:

Question **4**

Complete

Mark 4.00 out of 4.00

A Si p-n-p BJT has uniform dopings of $N_E = 10^{18}/cm^3$, $N_B = 10^{16}/cm^3$ and $N_c = 10^{15}/cm^3$. The metallurgical base width is 1.2 µm. Calculate the following:

(a) built-in potential of EB junction

(b) built-in potential of CB junction

(c) The effective base width if a reverse bias of 30 V is applied across the CB junction

Answer: a) 0.817V b)0.637V c)6.83*10^-6 m.

Comment:

◄ Tutorial 4

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