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NPTEL

Unit 11 - Week 10: MOSFET: II

Assignment 10

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment. **Due on 2018-10-10, 23:59 IST.**

1) Assume that the subthreshold current of a MOSFET (in amperes) is given by: ***1 point***

$I_D = 10^{-15}$ exp(V_{GS} / 2.1 *V_t)
over the range 0 < V_{GS} < 1V and where the factor 2.1 takes into account the effect of interface states. Assume that the value of thermal voltage V_t is 25.9 mV. Assume that 10^6 identical transistors on a chip are all biased at the same V_{GS} and at VDD = 5V.

Calculate the ratio of subthreshold current in the MOSFET device at $V_{GS} = 0.7V$ to the subthreshold current at
$V_{GS} = 0.5V$

- 100
- 82.5
- 39.5
- 1

No, the answer is incorrect.
Score: 0

Accepted Answers:
39.5

2) With reference to details given in question-1, calculate the total current that must be supplied to the chip at $V_{GS} = 0.7V$ ***1 point***

- 0.388 mA
- 9.83 mA
- 0.678 mA
- 9.83 pA

- 1.94 mW
- 49,2 mW
- 22.8 mW
- 77 mW

No, the answer is incorrect.
Score: 0

Accepted Answers:
77 mW

4) A silicon MOS device has the following parameters: $N_A = 10^{16} cm^-3$ Oxide thickness = 20 nm. Calculate the body-effect coefficient for the device. ***1 point***

- $3.33V^{0.5}$
- $0.333V^{0.5}$
- $0.03V^{0.5}$
- $33.33V^{0.5}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$0.333V^{0.5}$

5) For the MOS device given in question-4, calculate the change in threshold voltage for $V_{SB} = 1V$. Assume thermal voltage is 25.9 mV and $n_i = 1.5x10^{10} cm^{-3}$ ***1 point***

- 0.16 V
- 0.33 V
- 1 V
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.16 V

6) Consider an n-channel MOSFET with channel width 30 um and channel length 1 um. The oxide capacitance is 69 nF/sqcm. Assume that the drain current in the non-saturation region for $V_{DS} = 0.07V$ is 25 uA at $V_{GS} = 1.5V$, and 65 uA at $V_{GS} = 2.5V$. Extract the mobility (in sqcm/Vs) from the given data (Assume small-V_{DS} approximation for the drain current equation). ***1 point***

- 552
- 138
- 276
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
276

7) Which of the following statements are true ? ***1 point***

i. The interface states affect the subthreshold-swing of a MOSFET due to presence of additional capacitances

ii. The C-V characteristics curve of a MOS-system shifts to left/right based on the presence of trap charges in the oxide

iii. Presence of trap-charges has no effect on the C-V characteristics of a MOS-system

iv. Charges present at the oxide-semiconductor interface has strong effects on threshold voltage value.

- i only
- ii and iii
- ii only
- i, ii and iv

No, the answer is incorrect.
Score: 0

Accepted Answers:
i, ii and iv

8) Constant voltage scaling is applied to a MOSFET with a scaling factor of k=5. As the MOSFET features are scaled down, the current in the MOSFET: ***1 point***

- increases by a factor of 5
- decreases by a factor of 5
- increases by a factor of 25
- decreases by a factor of 25

No, the answer is incorrect.
Score: 0

Accepted Answers:
increases by a factor of 5

9) An n-MOS transistor has the following parameters: Channel length = 1 um, Channel width = 10 um, Oxide thickness = 25 nm, $N_A = 5x10^{15} cm^{-3}$, applied voltages = 3V. If the device is to be scaled using constant-field scaling with a scaling factor of k = 0.7, the channel length and channel width for the scaled device would be: ***1 point***

- 7 um, 0.7 um
- 7 um, 7 um
- 0.7 um, 7 um
- 0.7 um, 0.7 um

No, the answer is incorrect.
Score: 0

Accepted Answers:

0.7 um, 7 um

10) Find the oxide thickness for the scaled device given in question-9. ***1 point***

- 17.5 nm
- 25 nm
- 35.7 nm
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
17.5 nm

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