Assignment 9

The due date for submitting this assignment has passed. **Due on 2018-10-03, 23:59 IST.**
As per our records you have not submitted this assignment.

1) Consider a n-channel MOSFET with $W = 15 \text{ um}$, $L = 2 \text{ um}$, and $Cox = 69 \text{ nF/cm}^2$. Assume that, in the non-saturation regime with $V_{DS} = 0.1V$, the drain current is 35 $\mu A$ for a gate-to-source voltage of 1.5 V, and 75 $\mu A$ for a gate-to-source voltage of 2.5 V. Compute the threshold voltage of the MOSFET from the given data. (Use small-$V_{DS}$ approximation in the drain current equation)

No, the answer is incorrect.
**Score: 0**
**Accepted Answers:**
0.625 V

2) The parameters of a p-channel MOSFET are as follows: Mobility of holes = 310 $\text{ cm}^2/\text{Vs}$, oxide thickness = 22 nm, $W/L = 60$, and threshold voltage is -0.4 V. If the transistor is biased in saturation region, find the ratio of drain currents corresponding to $V_{SG} = 1V$ and $V_{SG} = 2V$

No, the answer is incorrect.
**Score: 0**
**Accepted Answers:**
0.14

3) A silicon n-MOSFET has $W = 10 \text{ um}$ and $L = 1 \text{ um}$. The oxide thickness is 20 nm and the threshold voltage is 1V. The device is biased with a gate-to-source voltage of 3V and a drain-to-source voltage of 5V. Assume that the mobility is 300 $\text{ cm}^2/\text{Vs}$. The MOSFET is biased in which region of operation?

No, the answer is incorrect.
**Score: 0**
**Accepted Answers:**
Linear
Sub-threshold
Saturation
1) For the n-MOSFET given in question (3), calculate the value of transconductance.

- 4.14 mS
- 1.035 mS
- 2.07 mS
- 8.28 mS

No, the answer is incorrect.
Score: 0
Accepted Answers:
Saturation

4) For the n-MOSFET given in question (3), calculate the value of transconductance.

- 4.14 mS
- 1.035 mS
- 2.07 mS
- 8.28 mS

No, the answer is incorrect.
Score: 0
Accepted Answers:
Saturation

5) Consider an ideal n-channel MOSFET with channel length 1.25 um. The mobility of electrons is $650 \text{cm}^2/\text{Vs}$ and the threshold voltage is 0.65 V. Design the channel width of the MOSFET such that the saturation drain current is 4 mA for an applied gate-to-source voltage of 5 V. Take oxide capacitance to be 69 nF/cmsq.

- 11.8 um
- 65.8 um
- 125 um
- 40 um

No, the answer is incorrect.
Score: 0
Accepted Answers:

6) The threshold voltage for a MOSFET at 300K is 350 mV with a reduction of 1mV/K. Assume that the mobility changes with temperature (in K) as: $\mu(T) = \mu(300K) \times (300K/T)^2$. Assuming perfect velocity saturation, the gate voltage, at which the saturation currents at 300K and 400K are equal, is ________. (Make an assumption that the saturation velocity remains independent of temperature).

- 200 mV
- 695 mV
- 478 mV
- 312 mV

No, the answer is incorrect.
Score: 0
Accepted Answers:

7) Consider a MOS structure with a p-type semiconductor substrate doped to $N_A = 10^{16} \text{ cm}^{-3}$, with thickness of SiO2 insulator as 50 nm. Let the equivalent oxide surface charge density be 16 nC/cmsq. The metal-semiconductor work-function difference is - 0.8 V. Calculate the value of flat-band voltage.

- - 1.03 V
- - 1.43 V
- - 0.8 V
- 1.43 V

No, the answer is incorrect.
Score: 0
Accepted Answers:
8) For a MOSFET in the sub-threshold region of operation, the $\log I_{DS}$ vs $V_{GS}$ plot is a/an: 1 point

- Quadratic curve
- Exponential curve
- Straight line
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
Straight line

9) Which of the following statements is/are true with regards to Channel Length Modulation in a MOSFET device? 1 point

i. It is similar to Base width modulation in BJTs
ii. The pinch-off point relocates with respect to applied drain voltage
iii. Drain voltage influences the current-voltage characteristics of a MOSFET in saturation

i
iii
i and ii
i, ii and iii

No, the answer is incorrect.
Score: 0
Accepted Answers:
i, ii and iii

10) The subthreshold swing of an enhancement mode MOSFET: 0 points

- increases as the depletion capacitance per unit area decreases
- increases as the depletion capacitance per unit area increases
- is typically less than 59mV/dec at 300K
- is typically greater than 59mV/dec at 300K

No, the answer is incorrect.
Score: 0
Accepted Answers:
is typically greater than 59mV/dec at 300K