X

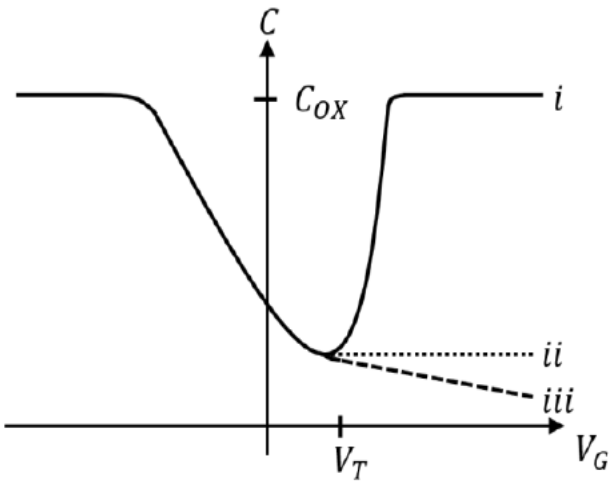
Unit 9 - Week 8 : Metal Oxide Semiconductor Capacitor (MOSCAP) and CV Characteristics

Assignment 8

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2018-09-26, 23:59 IST.

1) An ideal N-MOS capacitor is subjected to a C-V measurement with a very fast DC sweep and a high frequency small signal. Which of the following C-V characteristics will it exhibit ? ***1 point***



- i
- ii
- iii
- None of the above

No, the answer is incorrect.
Score: 0

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- 522 nm
- 41 nm
- 872 nm
- 311 nm

No, the answer is incorrect.
Score: 0

Accepted Answers:
41 nm

3) A MOS capacitor is biased such that the majority carriers pile up at the oxide-semiconductor interface. Which mode is the MOS capacitor operating ? ***1 point***

- strong inversion
- weak inversion
- depletion
- accumulation

No, the answer is incorrect.
Score: 0

Accepted Answers:
accumulation

4) Consider a MOS-capacitor with p-type silicon substrate at T = 300K doped to $N_A = 1X10^{16}/cc$. The oxide is silicon dioxide with a thickness of 55 nm. The area of the device is $2X10^{-3}cm^2$. Assume thermal voltage is 25.9 mV and $n_i = 1.5X10^{10}/cc$. Calculate the value of total oxide capacitance of the device in picofarads. ***1 point***

- 126 pF
- 62.8 pF
- 628 pF
- 12.6 pF

No, the answer is incorrect.
Score: 0

Accepted Answers:
126 pF

5) For the MOS-capacitor given in question (4), calculate the value of maximum depletion width x_d. ***1 point***

- 27 μm
- 9 μm
- 3 μm
- 0.3 μm

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.3 μm

6) For the MOS-capacitor given in question (4), calculate the value of effective ***1 point***

capacitance C_{eff} (unit-area capacitance) corresponding to when maximum depletion width is achieved.

- $7.24X10^{-10}F/cm^2$
- $2.23X10^{-8}F/cm^2$
- $6.56X10^{-9}F/cm^2$
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
$2.23X10^{-8}F/cm^2$

7) For a MOS-capacitor biased in accumulation mode, the effective capacitance is: ***1 point***

- $\frac{C_{ox}}{2}$
- $C_{ox} + C_{dep}$
- $\frac{C_{ox} * C_{dep}}{C_{ox} + C_{dep}}$
- C_{ox}

No, the answer is incorrect.
Score: 0

Accepted Answers:
C_{ox}

8) Consider the following statements: ***1 point***

For a MOS capacitor with gate voltage equal to the threshold voltage,

i. The surface potential is equal to twice the value of ϕ_F
ii. There is no band-bending in the semiconductor
iii.The inversion charge concentration at the interface matches the majority carrier concentration in the bulk
iv. The surface potential is equal to ϕ_F

Which of the above statements are false?

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
ii and iv

9) For a MOS-capacitor under strong inversion, the surface charge density: ***1 point***

- decreases exponentially as a function of surface potential
- increases exponentially as a function of surface potential
- increases linearly as a function of surface potential
- does not change with surface potential

No, the answer is incorrect.
Score: 0

Accepted Answers:
increases exponentially as a function of surface potential

10) Consider a MOS capacitor with p-type silicon substrate at T=300K doped to $N_A = 1X10^{14}/cc$. The oxide is silicon dioxide with a thickness of 50nm. Let $\phi_{MS} = -0.83V$. Assume $n_i = 1.5X10^{10}/cc$ and thermal voltage is 25.9mV. Calculate the threshold voltage of the MOS capacitor. ***1 point***

- - 0.32 V
- 0.8 V
- - 0.77 V
- - 0.13 V

No, the answer is incorrect.
Score: 0

Accepted Answers:
- 0.32 V

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