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Week 12 Quiz ANSWERS: MOS IV
ECE 305: Semiconductor Devices
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Answer the **multiple choice questions** below by choosing the **one, best answer**.

- 1) The ON-current for an N-channel MOSFET occurs when the device is biased how? (The power supply voltage is V_{DD} .)
 - a) $V_{GS} = V_T, V_{DS} = V_{DD}$.
 - b) $V_{GS} = V_{DD}, V_{DS} = V_T$.
 - c) $V_{GS} = V_{DD}, V_{DS} = V_{DD}$.**
 - d) $V_{GS} = V_T, V_{DS} = V_T$.
 - e) $V_{GS} = V_T, V_{DS} = 0$.

- 2) The subthreshold swing is defined as:
 - a) The increase in gate voltage necessary to increase the drain current by a factor of 2.
 - b) The increase in gate voltage necessary to increase the drain current by a factor of 10.**
 - c) The increase in drain voltage necessary to increase the drain current by a factor of 2.
 - d) The increase in drain voltage necessary to increase the drain current by a factor of 10.
 - e) The increase in source voltage necessary to increase the drain current by a factor of 10.

- 3) What is the direction of current flow in N- and P-channel MOSFETs?
 - a) Out of the drain for NMOS and out of the drain for PMOS.
 - b) Out of the drain for NMOS and into the drain for PMOS.
 - c) Into the drain for NMOS and into the drain for PMOS.
 - d) Into the drain for NMOS and out of the drain for PMOS.**
 - e) None of the above.

- 4) What is the transfer characteristic of a MOSFET in the common source configuration?
 - a) A plot of the drain current vs. the drain voltage.
 - b) A plot of the drain voltage vs. the gate voltage.
 - c) A plot of the drain current vs. the gate voltage.**
 - d) A plot of the gate voltage vs. the gate current.
 - e) A plot of the gate voltage vs. the gate current.

- 5) For a long channel MOSFET biased “beyond pinch-off,” how does the saturated drain current vary with $(V_{GS} - V_T)$?
- As $(V_{GS} - V_T)^{0.5}$.
 - As $(V_{GS} - V_T)^{1.0}$.
 - As $(V_{GS} - V_T)^{1.5}$.
 - As $(V_{GS} - V_T)^{2.0}$.**
 - As $(V_{GS} - V_T)^{2.5}$.
- 6) For a short channel MOSFET biased at high V_{DS} , how does I_{DSAT} vary with $(V_{GS} - V_T)$?
- As $(V_{GS} - V_T)^{0.5}$.
 - As $(V_{GS} - V_T)^{1.0}$.**
 - As $(V_{GS} - V_T)^{1.5}$.
 - As $(V_{GS} - V_T)^{2.0}$.
 - As $(V_{GS} - V_T)^{2.5}$.
- 7) How does the subthreshold drain current vary with $(V_{GS} - V_T)$?
- As $\left[(V_{GS} - V_T) / (mk_B T) \right]^{0.5}$.
 - As $\left[(V_{GS} - V_T) / (mk_B T) \right]^{1.0}$.
 - As $\ln \left[(V_{GS} - V_T) / (mk_B T) \right]^{0.5}$.
 - As $\ln \left[(V_{GS} - V_T) / (mk_B T) \right]^{1.0}$.
 - As $\exp \left[(V_{GS} - V_T) / (mk_B T) \right]$.**
- 8) What is the minimum subthreshold swing at $T = 300$ K.
- 30 mV/decade.
 - 60 mV/decade.**
 - 90 mV/decade.
 - 120 mV/decade.
 - 150 mV/decade.