Lecture 1.6: Traditional IV Theory

1) Which of the following observations would indicate that velocity saturation is occurring in the MOSFET?

a) A drain to source saturation current that varies as \( I_{DS} \mu \sqrt{(V_{GS} - V_T)} \).

b) A drain to source saturation current that varies as \( I_{DS} \mu (V_{GS} - V_T) \).

c) A drain to source saturation current that varies as \( I_{DS} \mu (V_{GS} - V_T)^{3/2} \).

d) A drain to source saturation current that varies as \( I_{DS} \mu (V_{GS} - V_T)^2 \).

e) A drain to source saturation current that varies as \( I_{DS} \mu (V_{GS} - V_T)^3 \).

2) Which of the following expressions describes an N-channel MOSFET in the linear region?

a) \( I_{DS} = WC_{ox} \nu_{sat} (V_{GS} - V_T) \).

b) \( I_{DS} = \frac{W}{L} C_{ox} \nu_{sat} (V_{GS} - V_T) \).

c) \( I_{DS} = \frac{W}{\mu C_{ox}} (V_{GS} - V_T) V_{DS} \).

d) \( I_{DS} = \frac{W}{L} \mu C_{ox} (V_{GS} - V_T) V_{DS} \).

e) \( I_{DS} = \frac{W}{2L} \mu C_{ox} (V_{GS} - V_T)^2 V_{DS} \).

3) Which of the following expressions describes a short channel N-channel MOSFET in the saturation region?

a) \( I_{DS} = WC_{ox} \nu_{sat} (V_{GS} - V_T) \).

b) \( I_{DS} = \frac{W}{L} C_{ox} \nu_{sat} (V_{GS} - V_T) \).

c) \( I_{DS} = \frac{W}{\mu C_{ox}} (V_{GS} - V_T) V_{DS} \).

d) \( I_{DS} = \frac{W}{2L} \mu C_{ox} (V_{GS} - V_T)^2 \).

e) \( I_{DS} = \nu_{sat} C_{ox} (V_{GS} - V_T)^2 \).