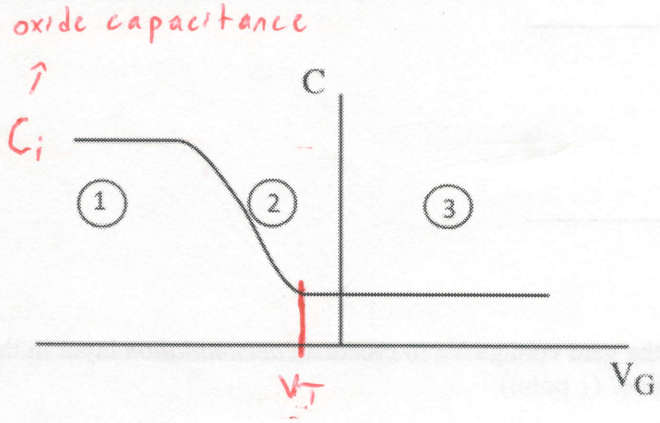
ECE 340: Quiz#3
V1

Name:_____

1) Consider the C-V characteristic of a MOS structure, below.



1.a) Identify the three regimes of interface charge (i.e. accumulation, depletion or inversion corresponding to each circle. (2 points)

① Accumulation

② Depletion

③ Inversion

1.b) On the diagram, identify the oxide capacitance. (1 point)

1.c) On the diagram, identify the threshold voltage. (1 point)

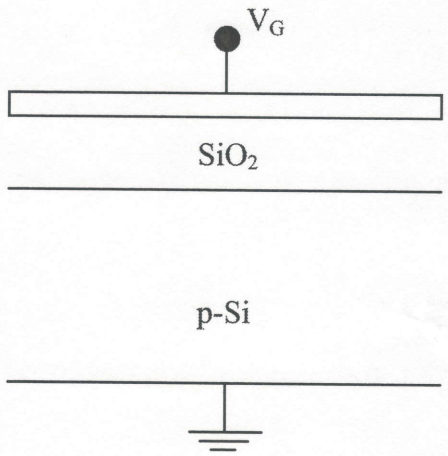
1.d) Is the semiconductor n-type, p-type or intrinsic? Explain. (1 point)

V_{Acc} is when $V_G < 0$, p-type

or

V_{inv} is when $V_G > 0$

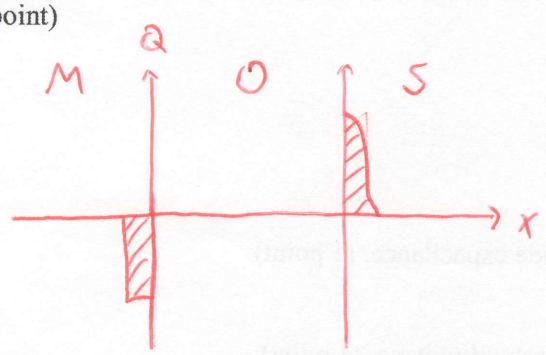
2) Consider a MOS capacitor with a p-Si substrate.



2.a) What is the sign of the gate voltage V_G to create an *accumulation* layer in the semiconductor at the Si/SiO_2 interface? (1 point)

$V_G < 0$, negative

2.b) Draw the corresponding *block charge* diagram in the semiconductor, the oxide and the metal. (1 point)



2.c) Draw the energy band diagram across the whole system (i.e. metal, oxide and semiconductor) when the semiconductor is in *inversion*, and indicate schematically the position of E_i, E_F, E_c and E_v, and the positions of the Si/SiO_2 and the $Metal/SiO_2$ interfaces. (3 points)