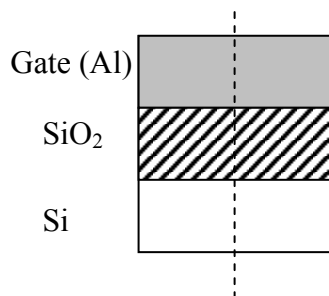


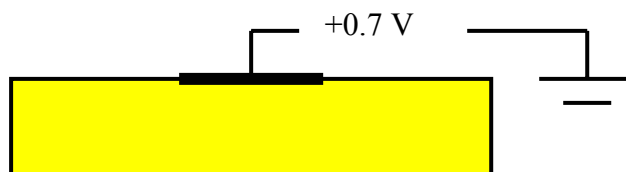
Student name & ID:

1. The gate capacitance of an MOS device with an Aluminum gate, Silicon substrate and SiO<sub>2</sub> insulator was measured to be  $3 \times 10^{-7}$  F/cm<sup>2</sup>. Also its threshold was measured to be  $-0.6$  V:
- (a) What is the oxide thickness?
  - (b) Assuming that the oxide trapped charge is zero, what is the substrate type? Calculate the substrate doping and draw the energy band diagram in the vertical direction
  - (c) Redo (b) above with an oxide trapped charge of  $10^{-7}$  cm<sup>-3</sup>.

Hint: Get all the constant you need from the text book, chapter 3. You can solve the resulting non-linear equations by hand (iterations) or write a simple program to do that. [10 marks]



2. A piece of doped Silicon requires a  $+0.7$  V surface potential to put its surface in strong inversion. What is the type and concentration of the dopant? [5 marks]



3. A P-type Silicon is doped with  $10^{16}$  cm<sup>-3</sup> acceptors. Calculate the doner concentration required to convert it to an N-type with a resistivity of  $1 \Omega$  cm. [5 marks]