August 2010 QE

1. Sketch and label both the high and low frequency C-V of an ideal low band gap (1 eV) n- MOS-C. Ideal means that the work function of the metal equals the work function of the semiconductor; the oxide has zero charge; and the oxide-semiconductor interface has no fixed charge.
10 pts. (5 pts for low frequency, 5 pts for high frequency)

2. Sketch and label both the high and low frequency, but not quasi-static, C-V *expected* for an ideal high band gap (>3 eV) p-MOS-C. Assume the ramp rate to be very slow.
30 pts. (5 points for high frequency, 15 points for low frequency

3a. Sketch and label the high frequency C-V of a low band gap p-MOS-C in which the Fermi level at the oxide-semiconductor interface is made to be invariant ("pinned") with respect to applied voltage and located at the mid-gap position in the semiconductor side of the interface. Assume a very slow ramp rate. (25 pts.)

3b. On the same sketch compare this result with the high frequency C-V of an ideal low band gap p-MOS-C. (10 pts.)

4. Draw and label the low frequency C-V of an ideal SOS-C device in which both "S" regions are n-type of the same low band gap semiconductor material and with the same doping. (25 pts)

Write in Exam Book Only