

2012-2013 PhD Qualifying Examination

Professor Yoshio Nishi

1. Draw band diagrams of 3 different semiconductor MOS diodes, where the semiconductor 1 has a band gap of 0.17eV, the semiconductor 2 has a band gap of 1.1eV and the semiconductor 3 has 3.2eV. All are doped with acceptor dopants of  $10^{16}\text{cm}^{-3}$
2. Draw room temperature C-V characteristics of those 3 MOS diodes, and explain how they behave when you increase the temperatures to 500C and 900C, given that those semiconductors withstand at those temperatures.
3. Explain  $I_d$ - $V_g$  and  $I_d$ - $V_d$  characteristics of nMOS FETs made of those semiconductors, where metal-semiconductor work function difference is zero in all cases