

Name:

Id#

COE 360, Principles of VLSI Design, Term 032
Quiz# 1

Date: Sunday, Feb. 29, 2004

Q1. Fill in the blank:

- (1) _____ is the motion of charges due to the application of an electric field.
- (2) _____ is the motion of charges resulting from a non-uniform charge distribution.
- (3) The current per unit area in a conducting medium is called the _____.
- (4) The conductivity of a material increases with the increase in the _____ and _____.
- (5) The applied voltage across a conductor increases with the increase in the _____ and _____.
- (6) The resistance of a conductor increases with the increase in _____ and the decrease in _____ and _____.
- (7) A silicon atom has _____ electrons, _____ of which are valence electrons.
- (8) At $T=0K$, all the valence electrons in a silicon semiconductor are in the _____ band.

- (9) _____ Semiconductors are pure crystals that contain no foreign atoms or impurities
- (10) _____ energy is the energy level below which all the energy states are filled with electrons and above which all the states are empty at $T=0K$.
- (11) In an intrinsic semiconductor, at a given temperature, the concentration of free electrons is _____ the concentration of free holes.
- (12) The addition of trivalent atoms to an intrinsic semiconductor results in a _____ type material, while the addition of pentavalent atoms to an intrinsic semiconductor results in a _____ type.
- (13) The majority charge carriers in a n-type material are _____ while the minority charge carriers are _____.
- (14) The mass action law states that under thermal equilibrium, the concentration of free electrons times the concentration of free holes is constant and is equal to _____.
- (15) If an intrinsic semiconductor material is doped with p-type impurities, the number of free holes _____ while the number of free electrons _____.
- (16) The charge neutrality law states that under thermal equilibrium, the semiconductor crystal is electrically _____.
- (17) The concentration of free electrons in an n-type material doped with donor concentration N_d is nearly _____ and the concentration of free holes is _____.