NAME:___________________________________

Department of Electrical and Computer Engineering
BREADTH EXAM

TTG Area: Circuits and Systems ECGR-3133/4134 Microelectronics - I

Answer True or False the following questions

1. Semiconductors can crystallize into the following lattice structures; namely (a) simple cubic (b) body centered cubic, and (c) face centered cubic.
2. The probability density function is given by the function $(|\Psi(x,t)|)^2\,dx$, which is the probability of finding a particle between x and $(x+dx)$ at a given time.
3. Density of states function is the density of allowed energy states expressed as a function of energy to calculate the electron and hole concentrations.
4. The Fermi-Dirac probability function gives the probability that allowed quantum state at the energy E is occupied by an electron.
5. Because the Fermi probability function rapidly approaches zero with increasing energy, the upper limit of the integration can be taken as infinity.
6. $\boldsymbol{E_{Fi} - E_{midgap} = \frac{3}{4} kT ln\left(\frac{m_p^*}{m_n^*}\right)}$ if the electron and hole effective masses are equal so that $m_p^* = m_n^*$, then the intrinsic Fermi level is exactly in the center of the bandgap.
7. A donor impurity is an impurity which accepts electron to the conduction band and add electrons to the conduction band without creating holes in the valence band.
8. Acceptor impurity is an impurity which donates an electron from the valence band and can generate holes in the balance band without creating electrons in the conduction band.
9. If the electron concentration in silicon is $n_o = 3x10^4 cm^{-3}$ then the $p_o = 7.5x10^{15} cm^{-3}$.
10. The semiconductor type in question 9 is n-type.