93學年度國立成功大學 微電子工程研究所 固態電子元件 試題 共 1 頁 第 1 頁
研究所招生考試

1. Please calculate the packing ratio of a diamond structure (5%). Silicon has the same structure as diamond, if we know the distance between two silicon atoms is 2.351Angstrom, and the weight of each Si atom is 4.81×10^{-23}gram, please calculate the mass density of Si. (5%)

2. Please state in your own words, what are the basic differences in assumption among the three theories to explain the heat capacity of the crystal structure (i.e. classical theory, Einstein's theory and Debye's theory) (10%)

3. Please calculate the coefficient of reflection and coefficient of transmission for an electron with energy of 2 eV experience a 1 eV potential energy step. (10%)

4. Please state in your own words, what are the basic differences in assumption among the three statistical distributions (i.e. Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac) (10%)

5. A piece of Si is doped with 10^{17} boron atoms/cm^3. Quantitatively draw the band diagram showing the location of Fermi level (E_F) and intrinsic Fermi level (E_i) at 300 ^{o}K. (12%)

6. For an ideal p-n-p transistor in Fig.1, $I_{Ep} = 5$mA, $I_{En} = 0.02$ mA, $I_{Cp} = 4.98$mA, and $I_{Cn} = 0.005$ mA. Find the common-emitter current gain β_0. (12%)

7. Find the subthreshold swing of the MOSFET with the I_D-V_G curve in Fig. 2. (12%)

8. Give two approaches to reduce the specific contact resistance of ohmic contacts. Explain your answer. (12%)

9. Explain the three basic transition processes (i.e. absorption, spontaneous emission, and stimulated emission) between two energy levels. (12%)

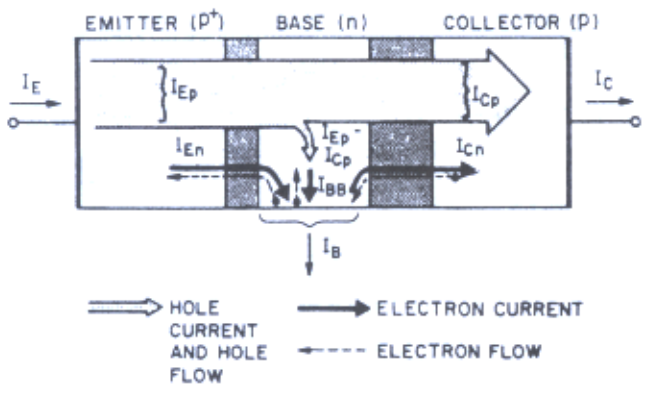

Fig. 1

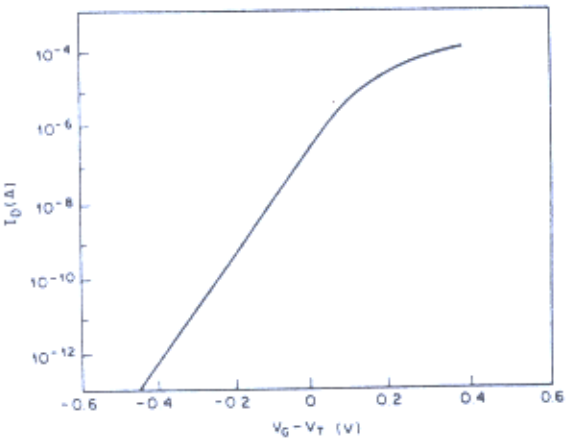

Fig. 2

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