國立高雄海洋科技大學 105 學年度碩博士班考試入學

微電子工程系碩士班—微電子學試題

【※須使用計算機】

1. Why the direction of current density is consistent with the gradient of N type doping distribution (∇N or $\frac{\partial n}{\partial x\,\partial y\,\partial z}$) and is opposite with the gradient of P type doping distribution(∇P or $\frac{\partial p}{\partial x\,\partial y\,\partial z}$) 20%

2. As we know, a.All the drifting carriers (electrons and holes) can contribute drift current. b. In any type of semiconductor, both electrons and holes exist. Now, N type Si with $1*10^{15}/cm^3$, why the drift current calculate only focuses on electrons? 10%

3. (a) plots the center-tapped rectifier and bridge rectifier circuits 10% (b) Under the same 220 V 60Hz ac source with $N_0 = 500$ turns peak voltage output voltage $V_O = 12$ V and the same diode cut-in voltage Vr = 0.7 V, compare the turns requested, PIV of diode at each rectifier. 20%

4. For the transistor in the circuit in Fig. 4, the parameters are $V_{TN} = 0.4$ V and $k`_n = 0.12$ mA/V^2 and W/L = 25. Determine V_{GS}, I_D and V_{DS} 20%. Sketch the load line and plot the Q-point. 20%

5. In Fig. 5, $R_S = 4k\Omega$, $R_1 = 850k\Omega$, $R_2 = 350k\Omega$ and $R_L = 4k\Omega$. The transistor parameters are $V_{TP} = -1.2$ V and $k`_p = 0.04$ mA/V^2, W/L = 80, and $\lambda = 0.05V^{-1}$. Find (a) I_{DQ} and V_{SDQ} (b) Av (c) R_O. 30%

Fig.5

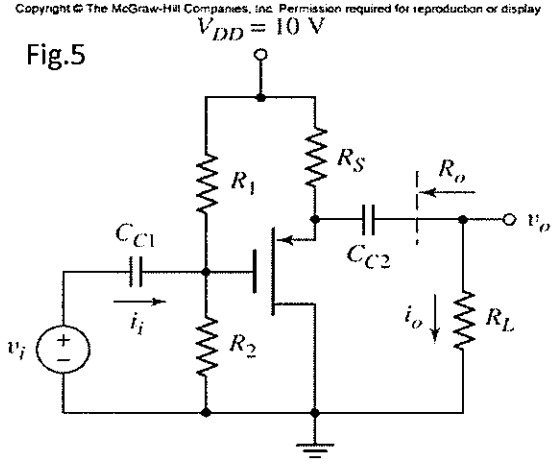
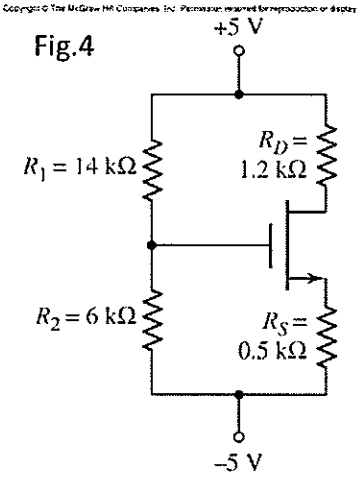


Fig.4



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