

國立高雄大學一百學年度研究所碩士班招生考試試題

科目：電子學

系所：應用物理學系

是否使用計算機：是

考試時間：100 分鐘

本科原始成績：100 分

1. Show the block diagram of a system for converting (1) a 64×8 ROM into a 512×1 ROM (2) a 64×8 ROM into a 256×2 ROM, using a selector/Mux. (20%)
2. With the circuit in Fig. 1, let $\beta=100$. (a) Find R_{TH} and V_{TH} for the base circuit. (10%) (b) Determine I_{CQ} , V_{CEQ} . (10%)
3. An NMOS transistor with $V_{TN}=1V$ has a drain current $i_D=0.8mA$ when $v_{GS}=3V$ and $v_{DS}=4.5V$. Calculate the drain current when: (a) $v_{GS}=2V$, and $v_{DS}=4.5V$; and (b) $v_{GS}=3V$, $v_{DS}=1V$. (20%)
4. The reverse-saturation current of a silicon pn junction diode at $T=300K$ is $I_s=10^{-12}A$. Determine the temperature range over which I_s varies from $0.5 \times 10^{-12}A$ to $50 \times 10^{-12}A$. (10%)
5. Describe an extrinsic semiconductor material and calculate the thermal equilibrium electron and hole concentrations for considering Gallium arsenide at $T=300^\circ K$ doped with nitrogen at a concentration of $10^{10}cm^{-3}$ and the conductivity for Gallium arsenide, the mobilities are $\mu_n=8500cm^2/V\cdot s$ and $\mu_p=400cm^2/V\cdot s$. (15%)
6. Consider two inverting op-amp circuits connected in cascade, as shown in Fig. 2. Let $R_1=20K\Omega$, $R_2=120K\Omega$, $R_3=15K\Omega$, and $R_4=75K\Omega$. If $V_i=0.2V$, calculate V_o , V_{o1} , I_1 , I_2 , I_3 , and I_4 . Determine the current into or out of the output terminal of each op-amp. (15%)

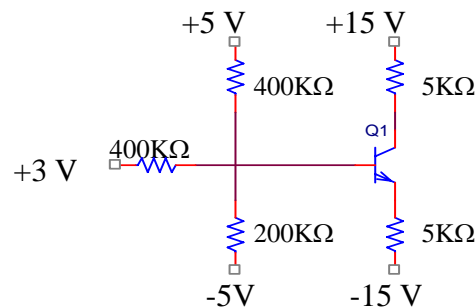


Fig. 1

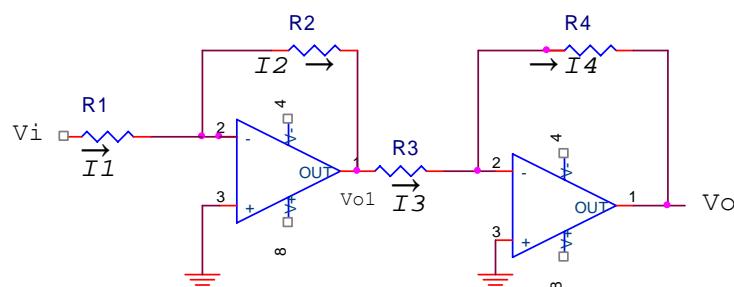


Fig. 2