

國立彰化師範大學 101 學年度碩士班招生考試試題

系所： 機電工程學系

組別： 乙組

科目： 電子學

☆☆請在答案卷上作答☆☆

共 2 頁，第 1 頁

1. Consider an ideal Op-amp circuit in Fig. 1. (1) Derive the transfer function $V_o(s)/V_i(s)$ and find the corresponding pole and zero. (2) Determine the output voltage $v_o(t)$ if $v_i(t)=2\sin(10t+15^\circ)\text{V}$ and $v_i(t)=2\sin(100t+15^\circ)\text{V}$ are applied, respectively. (20%)
2. For the circuit shown in Fig. 2, the transistor has $\beta=100$, $V_{BE(on)}=V_{EB(on)}=0.7\text{V}$, and $r_o=\infty$.
Find $I_1, I_2, I_{C1}, I_{B2}, I_{C2}, V_{CE1}, V_{EC2}$. (20%)
3. A circuit is connected as shown in Fig. 3 with ideal Op-amps. Find : (1) $V_o(s)/V_i(s)$. (2) 3-dB frequency. (15%)
4. The MOSFET amplifier is shown in Fig. 4. Assume the current source is ideal and the transistor has $r_o=20\text{k}\Omega$. The voltage gain $v_o/v_{sig}=0.86$ can be obtained if $R_L=\infty$. (1) What is the amplifier configuration? (CD, CG, CS). (2) Find R_{out} . (3) Determine v_o/v_{sig} if $R_L=25\text{k}\Omega$. (20%)
5. Consider the feedback amplifier of the Fig. 5. Assume the two MOSFETs are operated in saturation region, and the parameters $g_{m1}=g_{m2}=g_m$, and $r_{o1}=r_{o2}=r_o$. (1) Which topology is adopted in the circuit? (shunt-shunt, shunt-series, series-series, series-shunt). (2) Derive expressions for R_{in}, R_{of}, R_{out} and I_o/I_s in term of g_m, r_o, R_F, R_D, R_S . (25%)

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共 2 頁，第 2 頁

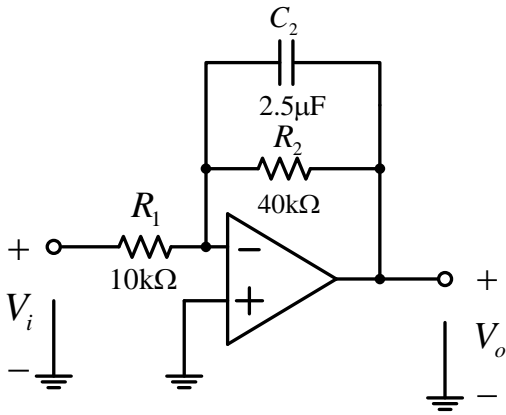


Fig. 1

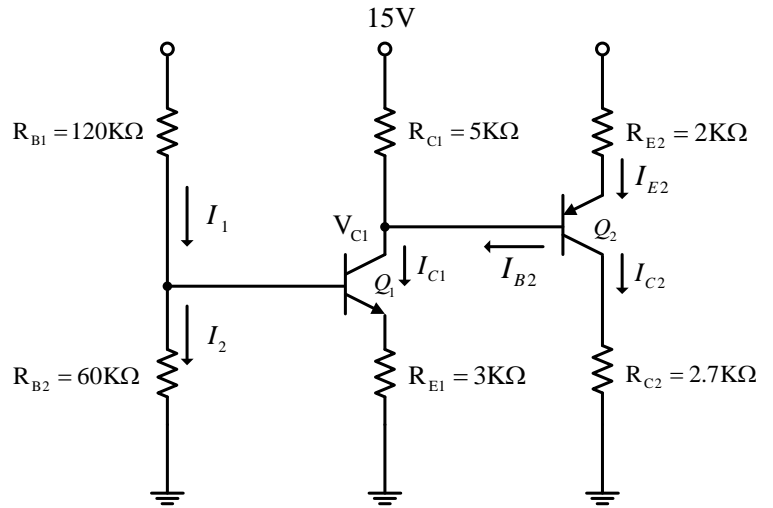


Fig. 2

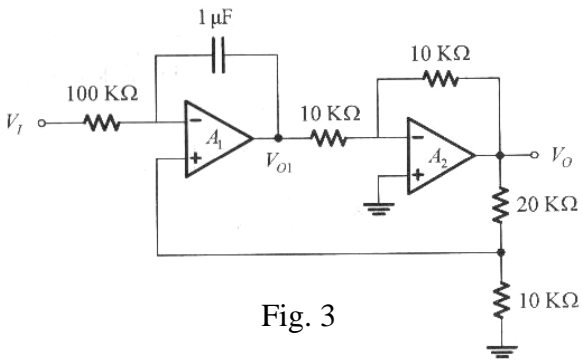


Fig. 3

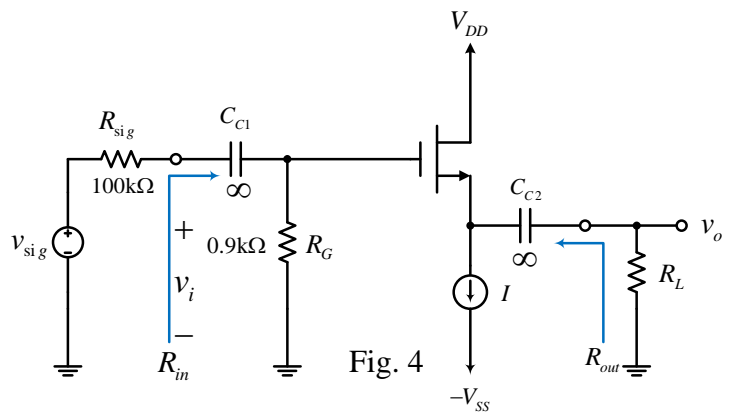


Fig. 4

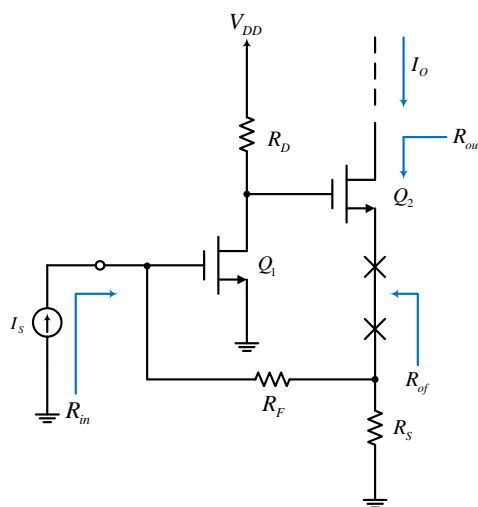


Fig. 5