國立臺北大學109學年度日間學士班暨進修學士班轉學生招生考試試題

學制系級：通訊工程學系日間學士班3年級

科　　目：電子電路

☐可 ☑不可使用計算機

Circuits & Electronics

1. (10%) Find the equivalent resistance of the terminal a-b in Fig 1.

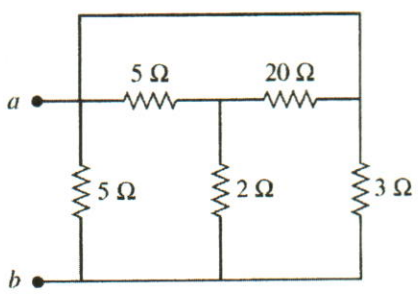

Fig. 1

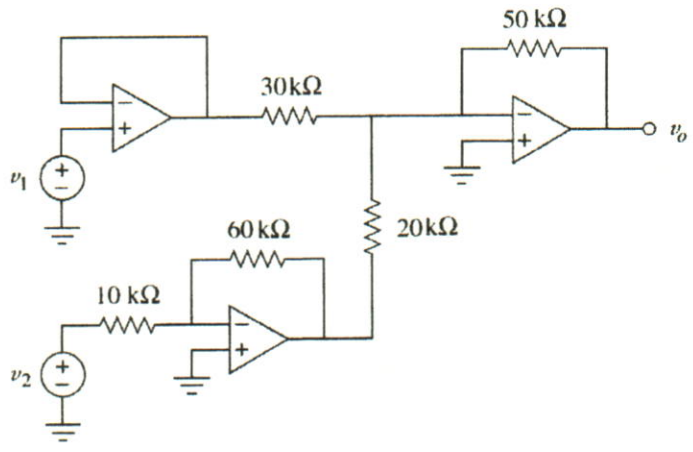

Fig. 2

2. (10%) Use V_1 and V_2 to express the voltage V_0 of the op amp circuit in Fig. 2.

3. (Total 10%) For the RL circuit in Fig. 3, assume $Vs = V_m \cos \omega t$.
   (a) Obtain the transfer function Vo/Vs (5%).
   (b) Sketch its frequency response for the magnitude in dB scale. Mark the magnitude and the frequency of the half power point. (5%)

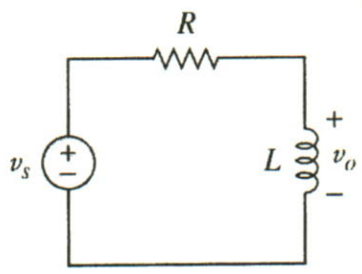

Fig. 3

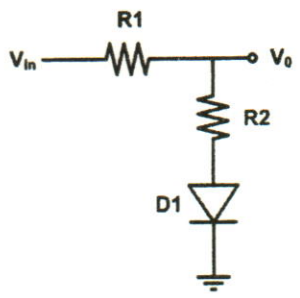

Fig. 4

4. (10%) Plot the input/output characteristic of the circuit shown in Fig. 4 using the ideal model.

5. (10%) A p-type semiconductor has the doping level $N_A = 1.5 \times 10^{16}/\text{cm}^3$. Assume that $n_i = 2 \times 10^{10}/\text{cm}^3$. Find the hole and electron concentrations (you must specify what value is hole concentration and what value is electron concentration).

試題隨卷繳交　　接背面

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6. (10%) Express the voltage gain of the circuit in Fig. 5. Assume small signal parameters are g_m and r_π and assume $V_A = \infty$. Assume the emitter current and the collector current are approximately equal.

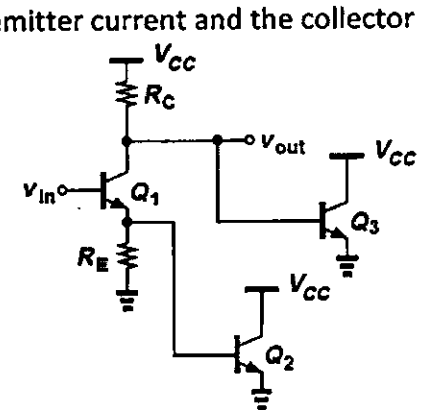

Fig. 5

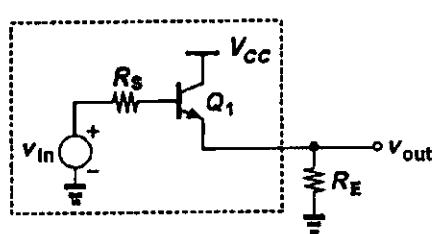

Fig. 6

7. (10%) Determine the voltage gain of a follower driven by a finite source impedance of Rs in Fig. 6. Assume small signal parameters are g_m, r_π, and β and assume $V_A = \infty$.

8. (10%) Determine the value of W/L in Fig. 7 that places *M1* at the edge of saturation. $\mu_n C_{ox} = 50\mu A/V^2$, $V_{th} = 0.5V$ and $\lambda = 0$.

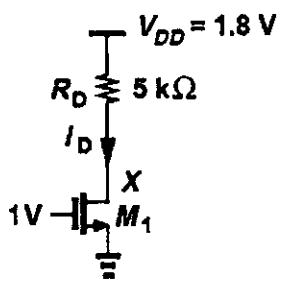

Fig. 7

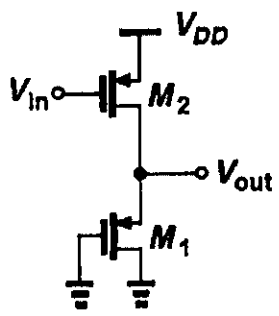

Fig. 8

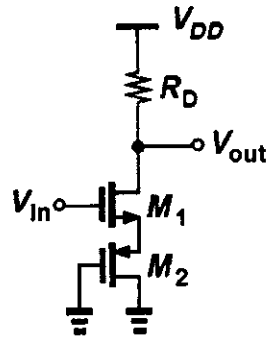

Fig. 9

9. (10%) Determine the voltage gain of the circuit shown in Fig. 8 if $\lambda > 0$. Assume small signal parameters are g_m and r_o.

10. (10%) Compute the voltage gain of the circuit shown in Fig. 9, if $\lambda = 0$ for M1 and $\lambda > 0$ for M2. Assume small signal parameters are g_m and r_o.

試題隨卷繳交