

國立嘉義大學 100 學年度

資訊工程學系碩士班 (乙組) 招生考試試題

科目：電子電路學

1. Find the equivalent resistance “ R_{ab} ” between terminals a and b in circuit of Fig. 1. (10%)

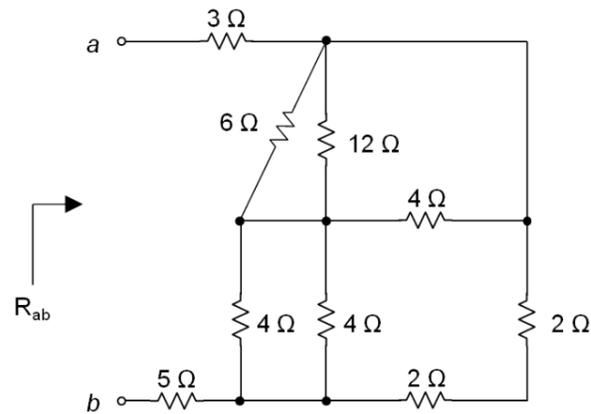


Fig. 1

2. The equivalent circuit of Fig. 2 has $V_{TH} = 35\text{ V}$ and $R_{eq} = 500\ \Omega$. If the conditions for “maximum power transfer” exist, determine:

- (a) The value of “ R_L ”. (10%)
 (b) The power “ P_L ” developed in R_L . (5%)

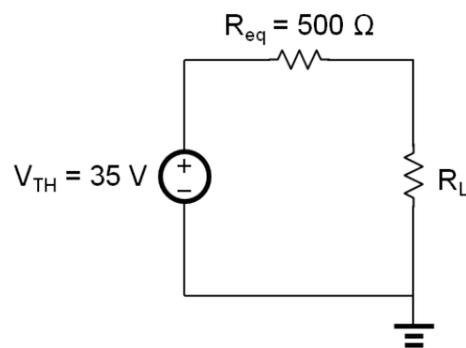


Fig. 2

3. For the circuit shown in Fig. 3, find the impedance “ Z ”, given $\omega = 4\text{ rad/s}$. (8%)

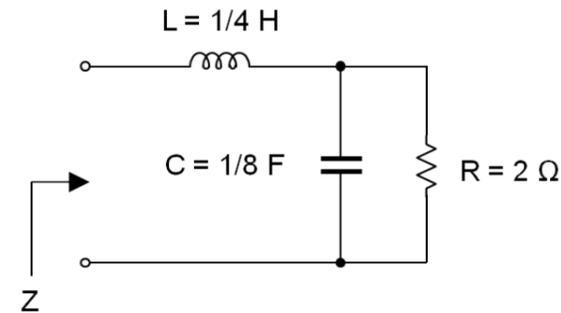


Fig. 3

4. In the circuit of Fig. 4, a weighted summer circuit using an ideal op amp has three inputs using $100\text{ k}\Omega$ resistors and a feedback resistor R_f of $50\text{ k}\Omega$. A signal v_1 is connected to two of the inputs while a signal v_2 is connected to the third.

- (a) Express “ v_o ” in terms of v_1 and v_2 . (10%)
 (b) If $v_1 = 3\text{ V}$ and $v_2 = -3\text{ V}$, what is “ v_o ”? (5%)

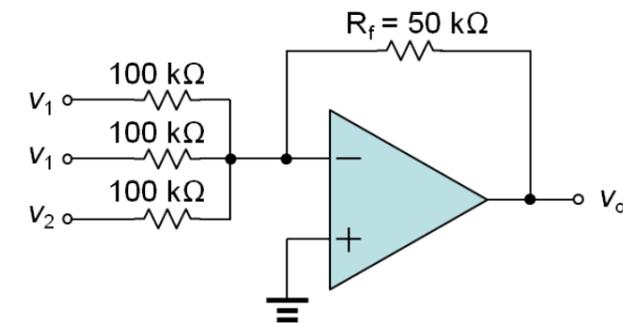


Fig. 4

5. Assuming that the diodes in the circuits of Fig. 5 and Fig. 6 are ideal, find the values of the labeled voltages and currents:

(a) The values of labeled voltage “ V_1 ” and current “ I_1 ” of Fig. 5. (10%)

(b) The values of labeled voltage “ V_2 ” and current “ I_2 ” of Fig. 6. (10%)

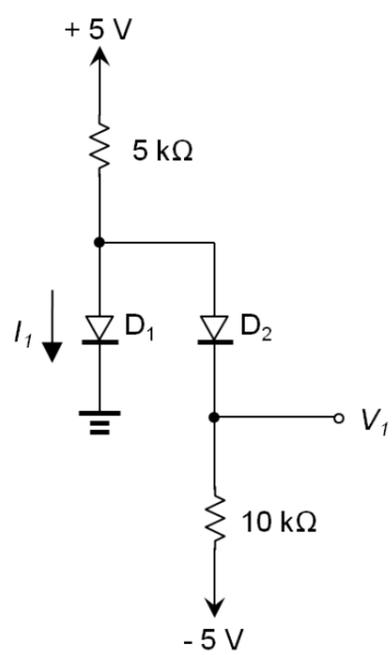


Fig. 5

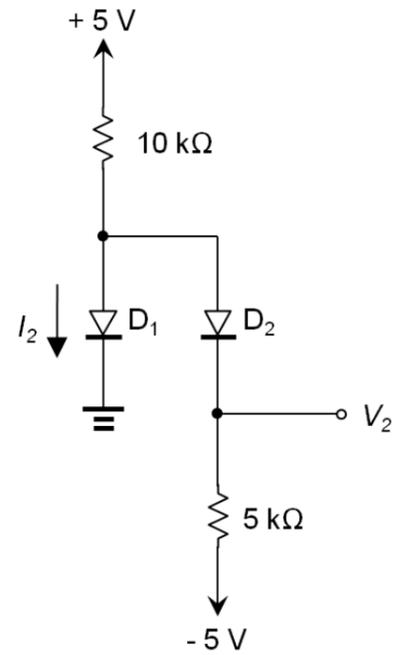


Fig. 6

6. Fig. 7 shows a common-source amplifier with a source resistance.

(a) Derive the expression for the overall voltage gain “ $G_v = v_o / v_{sig}$ ”. (10%)

(b) If the overall voltage gain G_v of the amplifier was measured with a resistance R_s of 1 kΩ in place and found to be -10 V/V. When R_s is shorted, but the circuit operation remained linear the gain doubled ($G_v = -20$ V/V). What must “ g_m ” be? (6%)

(c) What value of “ R_s ” is needed to obtain an overall voltage gain G_v of -8 V/V? (6%)

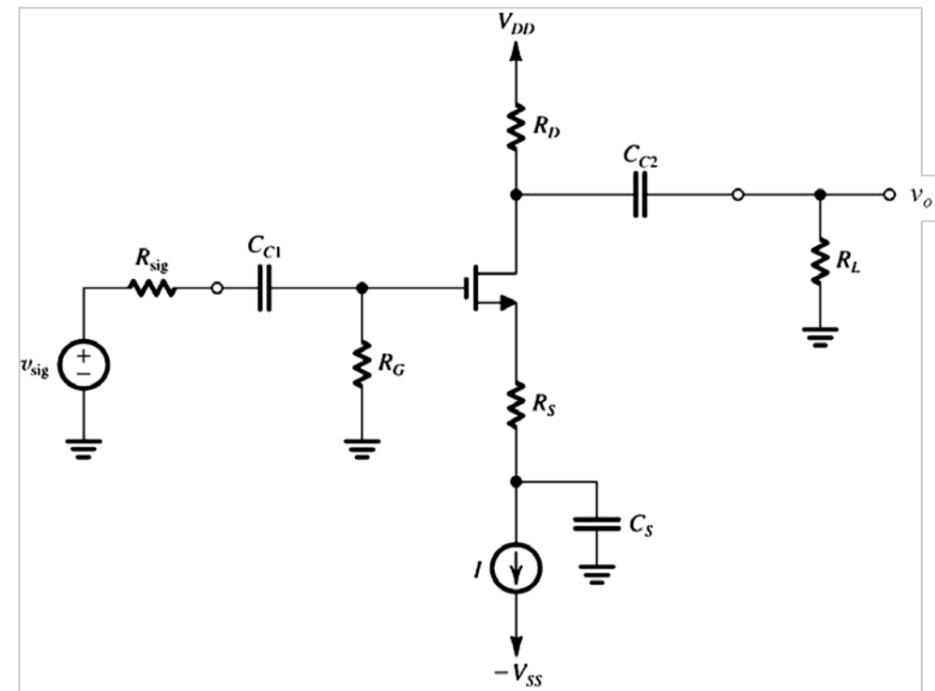


Fig. 7

7. For the circuit in Fig. 8 select a value for “ R_E ” so that the transistor saturates with a forced β of 10. Assume $V_{EB} = 0.7$ V and $V_{EC,sat} = 0.2$ V. (10%)

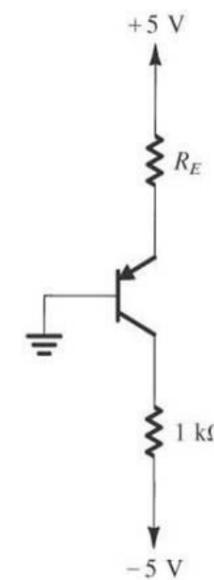


Fig. 8