

# 國立臺北科技大學 103 學年度碩士班招生考試

系所組別：2240 電子工程系碩士班丁組

## 第三節 電子學 試題

第一頁 共二頁

### 注意事項：

1. 本試題共六題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. For the circuit of Fig. 1, find  $I_Z$  for the following load resistors. Then find the power dissipated  $P_D$  by the Zener.

- (a)  $R_L = 3 \text{ k}\Omega$ . (5%)
- (b)  $R_L = 1 \text{ k}\Omega$ . (5%)

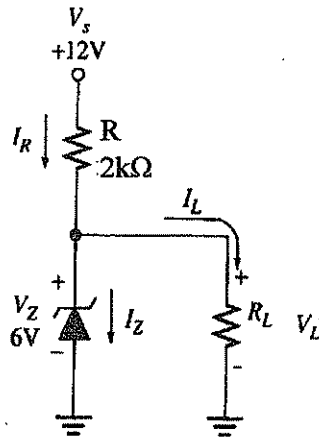


Fig.1 Zener diode circuit for problem 1

2. Assume each diode in the circuit shown in Fig.2 has a turn-on voltage of  $V_r = 0.7\text{V}$ .

- (a) Please calculate the current  $I_{D2}$  and the voltage  $V_O$ . (10%)
- (b) For the case when  $R_1 = 5 \text{ k}\Omega$  and  $R_2 = 15 \text{ k}\Omega$ , please calculate the current  $I_{D1}$  and  $I_{D2}$ . (10%)

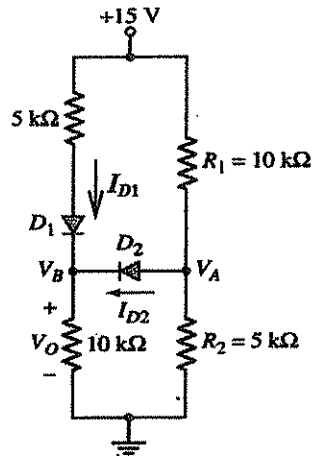


Fig.2 Multi-diode circuit for problem 2

3. Consider the circuit in Fig. 3. Assume each transistor has parameters of  $\beta = 100$  and  $V_{BE(on)} = 0.7V$ .
- Find the Thevenin voltage  $V_{TH}$  for this circuit. (5%)
  - Determine the value of  $I_{E1}$ . (5%)
  - Determine the value of  $I_{E2}$ . (5%)
  - Determine the value of  $V_{EC2}$ . (5%)

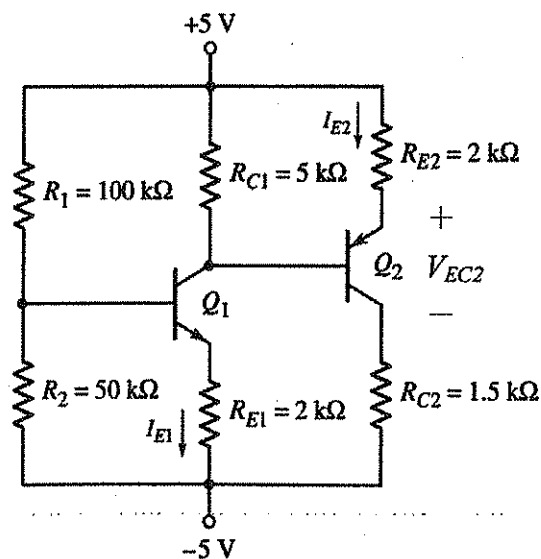


Fig.3 Multistage transistor circuit for problem 3

注意：背面尚有試題

4. Find the output voltage  $v_o$  for the circuit in Fig. 4 if

(a)  $R_2 = 1 \text{ k}\Omega$ . (5%)

(b)  $R_2 = 4 \text{ k}\Omega$ . (5%)

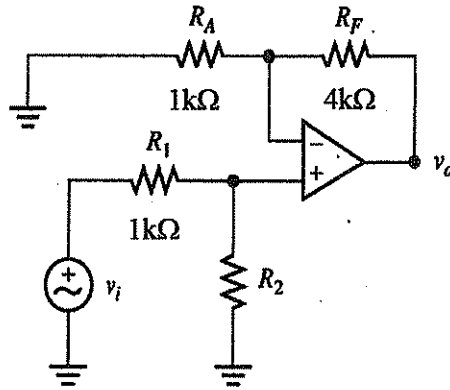


Fig.4 Circuit for problem 4

5. Assume the transistor and circuit parameters in Fig. 5 are:  $\beta = 100$  and  $V_{CC} = 12\text{V}$ ,

$V_{BE(\text{on})} = 0.7\text{V}$ ,  $R_C = 6 \text{ k}\Omega$ ,  $R_B = 50 \text{ k}\Omega$ ,  $V_{BB} = 1.2\text{V}$  and  $V_T = 0.026\text{V}$ .

(a) Determine the  $Q$ -point values of  $I_{CQ}$  and  $V_{CEQ}$ . (10%)

(b) Calculate the small-signal voltage gain  $A_v$  of the bipolar transistor circuit. (10%)

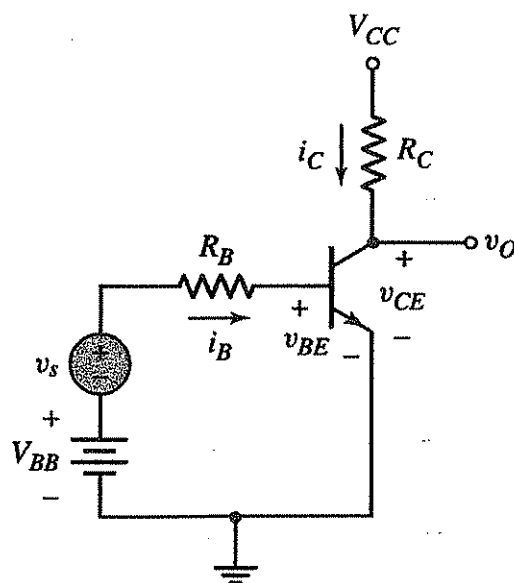


Fig.5 Circuit for problem 5

6. For the circuit of Fig. 6, find
- The gain and  $f_L$  for the high-pass filter. (4%)
  - The gain and  $f_H$  for the low-pass filter. (4%)
  - The total gain and bandwidth of this filter. (4%)
  - The center frequency  $f_o$  and the  $Q$  of the filter. (4%)
  - Draw the Bode plot for the complete filter. (4%)

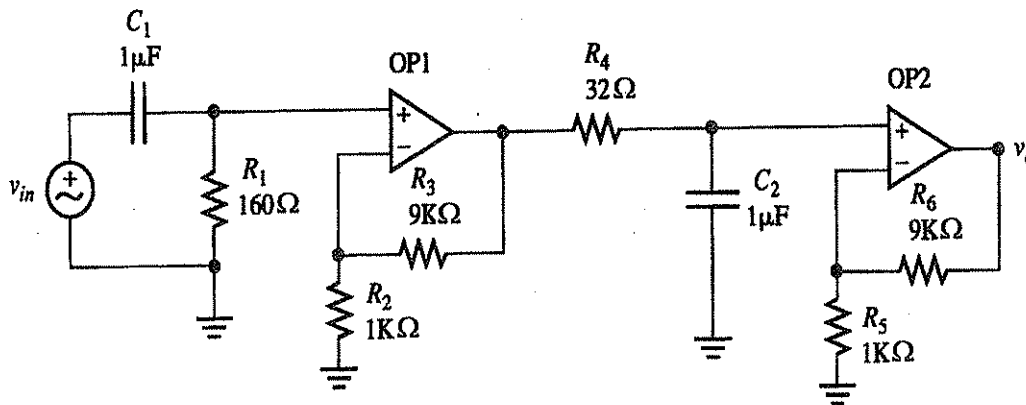


Fig.6 Filter circuit for problem 6