

# 逢甲大學107學年度碩士班考試入學試題

編號：24 科目代碼：308

科目	電子學	適用系所	電機工程學系	時間	90分鐘
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※請務必在答案卷作答區內作答。 共 2 頁 第 1 頁

1. (30%)

- (a) Please describe the “early effect” in BJT.
- (b) Please describe “channel length modulation” in MOSFET.
- (c) Please describe “body effect”.
- (d) Please describe “Miller effect”.
- (e) Please describe what’s the “loading effect”.
- (f) Please describe the characteristics of an ideal op amplifier.

2. (15%)

- (a) Sketch the hybrid- $\pi$  small signal model of BJT, including output resistance.
- (b) Sketch the topology of emitter follower circuit.
- (c) Sketch the topology of common-gate amplifier

3. (15%)

- (a) What’s the circuit in Fig. 1?
- (b) For an ideal op amplifier, please derive the voltage gain ( $V_o/V_I$ ) in Fig. 1.
- (c) What’s the value of  $R_1$  if the voltage gain  $A_v = 5$  and  $R_2 = 12 \text{ k}\Omega$ ?

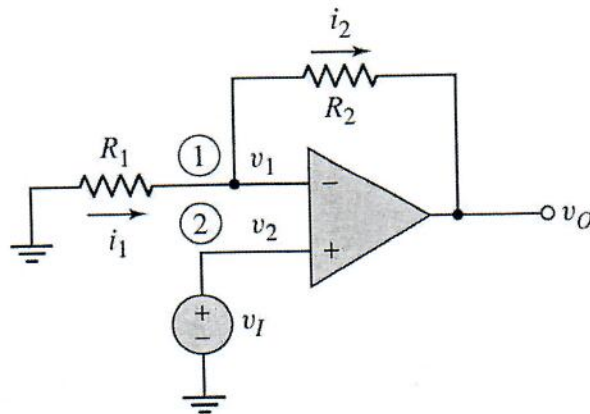


Fig. 1

4. (10%)

Consider a current mirror in Fig. 2. Assuming that all transistors are matched and neglect the effect of finite output resistances, if  $V^+ = 5\text{ V}$ ,  $V^- = 0\text{ V}$ , and all the transistor of  $V_{BE} = 0.7\text{ V}$ ,  $I_{REF} = 1\text{ mA}$ , and  $\beta = 100$ , (a) determine the value of  $R_1$  and (b)  $I_{O1}$ .

5. (10%)

For the circuit shown in Fig. 3, both diodes are identical. Find the value of  $R$  for which  $V = 50\text{ mV}$ .

6. (20%)

Design the circuit of Fig. 4 to establish a drain current of  $0.1\text{ mA}$  and a drain voltage of  $+0.3\text{ V}$ . The MOSFET has  $V_t = 0.5\text{ V}$ ,  $\mu_n C_{ox} = 400\text{ }\mu\text{A/V}^2$ ,  $L = 0.4\text{ }\mu\text{m}$ , and  $W = 5\text{ }\mu\text{m}$ . Specify the required values for  $R_S$  and  $R_D$ .

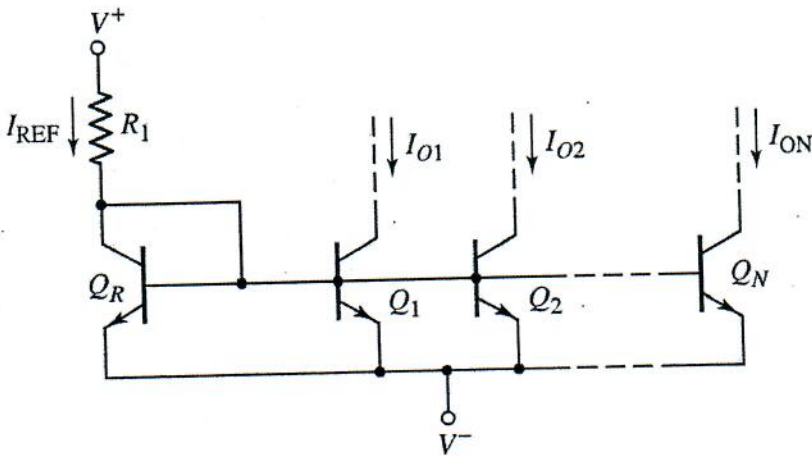


Fig. 2

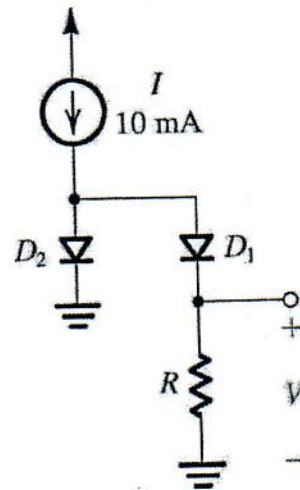


Fig. 3

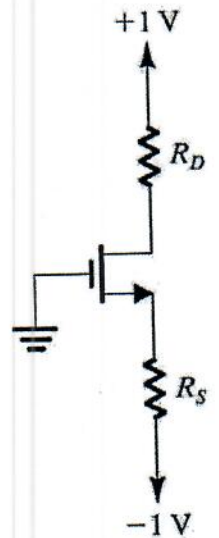


Fig. 4