

國立勤益科技大學九十九學年度研究所碩士班招生筆試試題卷
 所別：電子工程系 組別：電子組
 科目：電子學
 准考證號碼：□□□□□□□□ (考生自填)

考生注意事項：
 一、考試時間 100 分鐘。
 二、作答可由考場統一提供電子計算機。
 三、

試題一：〈10 分〉

An amplifier with an input resistance of $10\text{ K}\Omega$, when driven by a current source of $1\text{ }\mu\text{A}$ and a source resistance of $100\text{ K}\Omega$, has a short-circuit output current of 10 mA and an open-circuit output voltage of 10 V . When driving a $4\text{-K}\Omega$ load, what are the value of voltage gain, current gain, and power gain ?

試題二：〈10 分〉

For the circuit in Fig. p2, find the values of voltage gain V_o/V_i , the current gain i_L/i_i , and the power gain P_L/P_I .

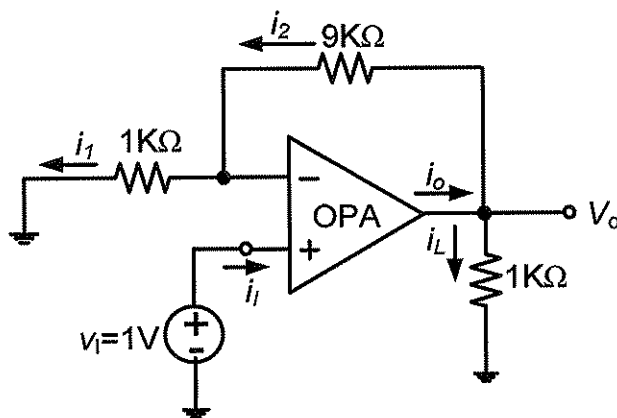


Fig. p2

試題三：〈10分〉

Derive an expression of the circuit in Fig. p3 for the voltage $V_o = (R_2/R_1)(V_2 - V_1)$, if we choose $(R_3/R_4) = (R_1/R_2)$.

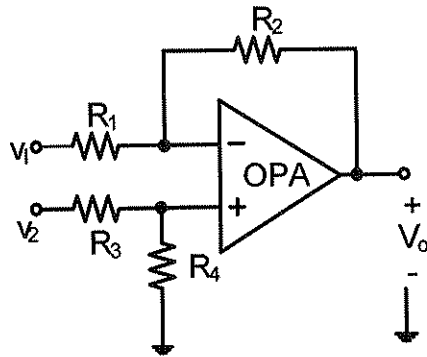


Fig. p3

試題四：〈10分〉

Assuming that the diodes in the circuits of Fig. p4 are ideal, utilize Thevenin's theorem to simplify the circuits and thus find the values of the labeled currents I and voltages V , assume diode has a 0.7V drop when conducting.

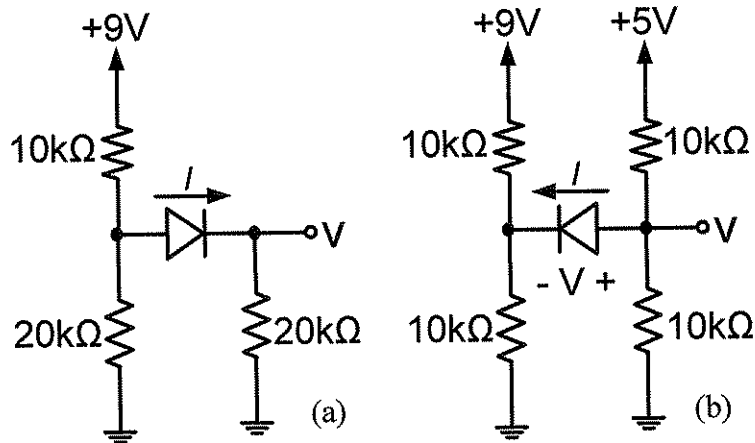


Fig. p4

試題五：〈10分〉

Design limiter circuits using only diodes and 10 KΩ resistors to provide an output signal limited to the range:

- (a) $-0.7V$ and above
- (b) $-2.1V$ and above
- (c) $\pm 1.4v$

Assume the each diode has a 0.7V drop when conducting.

試題六：〈10分〉

The MOSFET in Fig. p6 has $V_t = 1V$, $k'_n = 100\mu A/V^2$, and $\lambda = 0$. Find the required values of W/L and of R so that when $v_I = V_{DD} = +5V$, $r_{DS} = 50\Omega$, and $v_O = 50mV$.

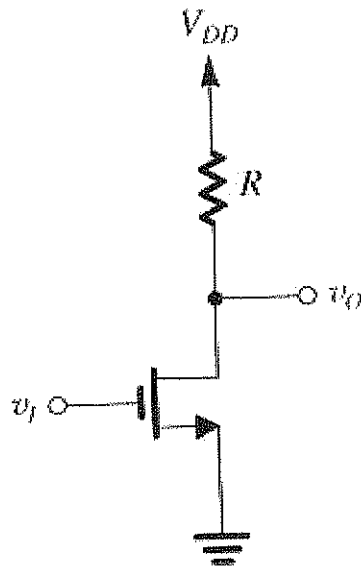


Fig. p6

試題七：〈15分〉

A CS amplifier using an NMOS transistor biased in the manner of Fig. p7 for which $g_m = 2mA/V$ is found to have an overall voltage gain G_v of $-16V/V$. What value should a resistance R_s inserted in the source lead have to reduce the voltage gain by a factor of 4?

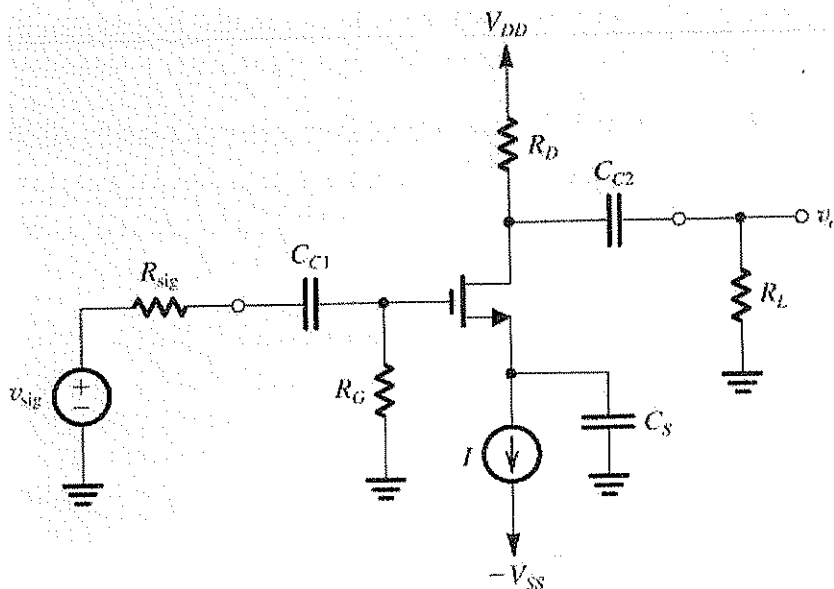


Fig. p7

試題八：〈10分〉

The transistor in the circuit of Fig. p8 has a very high β . Find V_E and V_C for $V_B = +2V$. Assume $V_{BE} \cong 0.7V$.

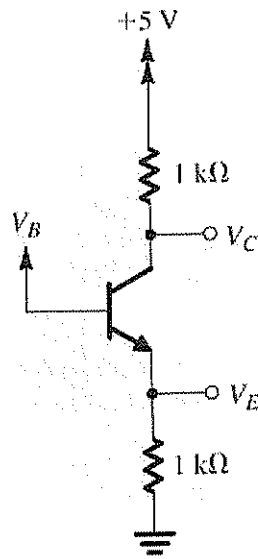


Fig. p8

試題九：〈15分〉

Consider the current-mirror circuit of Fig. p9 with two transistors having equal channel lengths but with Q_2 having a width four times that of Q_1 . If I_{REF} is $20\mu A$ and the transistors are operating at an overdrive voltage of $0.3V$, what I_O results? What is the minimum allowable value of V_O for proper operation of the current source? If $V_t = 0.5V$, at what value of V_O will the nominal value of I_O be obtained? If V_O increases by $1V$, what is the corresponding increase in I_O ? Let $V_A = 25V$.

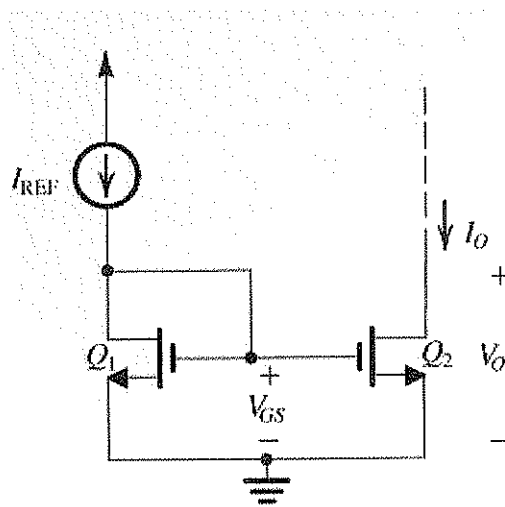


Fig. p9