

國立暨南國際大學九十三年學年度碩士班研究生入學考試試題

第 2 節電子學乙 適用:(電機所系統組 432)

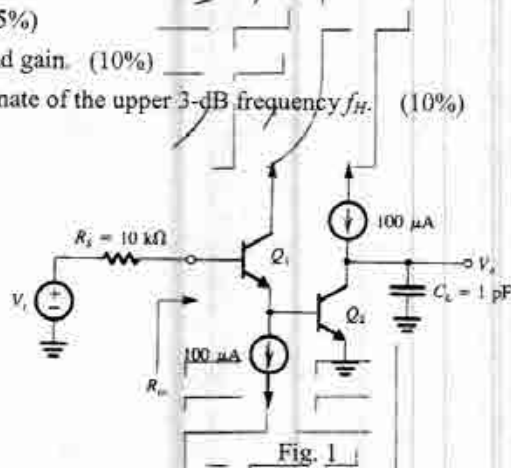
(本試題共 2 頁, 第 1 頁)

考生注意: 1. 依次序作答, 只要標明題號, 不必抄題。

2. 答案必須寫在答案卷上, 否則不予計分, 並限以藍黑色筆作答。

3. 試題隨卷繳回。(餘詳詳閱試場規則)

1. The transistors in the circuit of Fig. 1 have $\beta_0 = 100$, $V_A = 100$ V, and $C_\mu = 0.2$ pF. At a bias current of $100 \mu\text{A}$, $f_T = 400$ MHz.
 - (a) Find R_{in} . (5%)
 - (b) Find midband gain. (10%)
 - (c) Find an estimate of the upper 3-dB frequency f_H . (10%)



2. Consider the differential pair shown in Fig. 2. The offset voltage results from mismatches in the load resistances R_{D1} and R_{D2} and from mismatches in $Q1$ and $Q2$. Let

$$R_{D1} = R_D + \frac{\Delta R_D}{2}$$

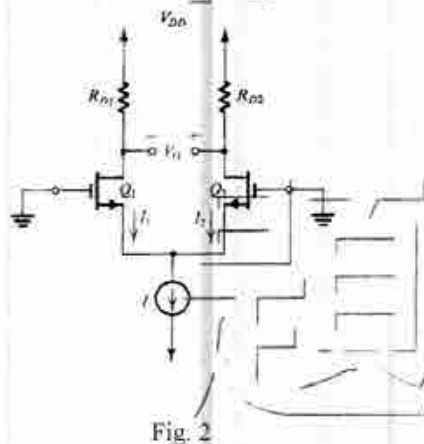
$$R_{D2} = R_D - \frac{\Delta R_D}{2}$$

and

$$\left(\frac{W}{L}\right)_1 = \frac{W}{L} + \frac{1}{2} \Delta \left(\frac{W}{L}\right)$$

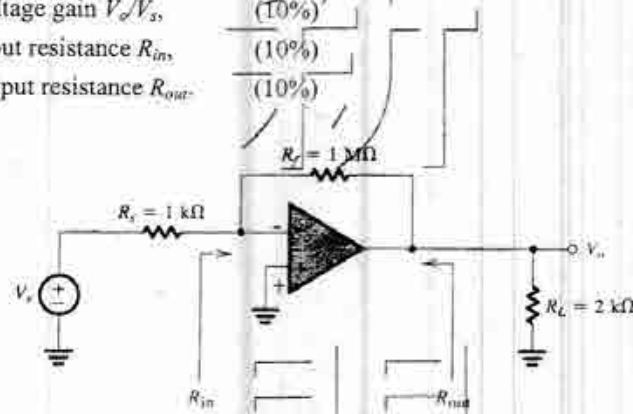
$$\left(\frac{W}{L}\right)_2 = \frac{W}{L} - \frac{1}{2} \Delta \left(\frac{W}{L}\right)$$

Show an estimate of the total input offset voltage. (15%)

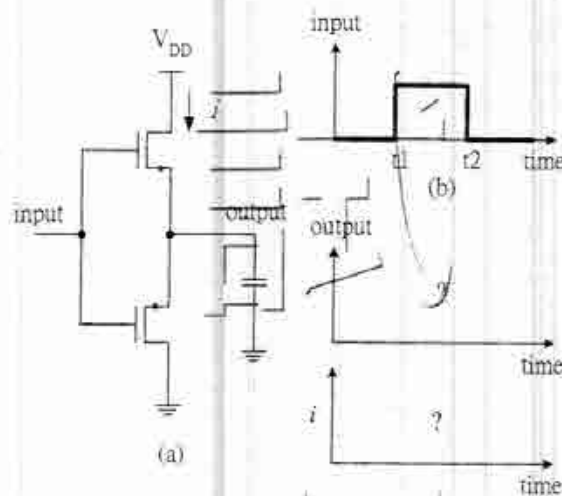


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3. Fig. 3 shows an inverting op amp configuration with the open-loop gain $\mu = 10^4$, $R_{id} = 100 \text{ k}\Omega$, and $r_o = 1 \text{ k}\Omega$. Use the feedback method to find
- the voltage gain V_o/V_s , (10%)
 - the input resistance R_{in} , (10%)
 - the output resistance R_{out} . (10%)



4. Fig. 4 (a) is a CMOS circuit. Apply a signal shown in Fig. 4 (b) to the input of the CMOS circuit. Sketch
- the output voltage waveform, (7%)
 - the current waveform of the power supply V_{DD} . (8%)



5. Sketch Bode plots for the magnitude and the phase of the transfer function:

$$T(s) = \frac{10^6(s+10^8)}{(s+10^5)(s+10^6)}$$

(15%)