

國立臺北科技大學九十九學年度碩士班招生考試

系所組別：2230 電腦與通訊研究所丙組

第二節 電子學 試題

第一頁 共一頁

注意事項：

1. 本試題共 5 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. Consider an inverting amplifier circuit shown in Fig. 1 using an operational amplifier and two resistors, $R_1 = 10 \text{ K}\Omega$ and $R_2 = 1 \text{ M}\Omega$. If the operational amplifier is specified to have an input bias current of 100 nA and an input offset current of 10 nA .

- (a) Find the output DC offset voltage. (5分)
- (b) What is the value of R_3 that could be placed in series with the positive input lead to minimize the output offset voltage? (5分)
- (c) What is the new output voltage when R_3 is connected? (10分)

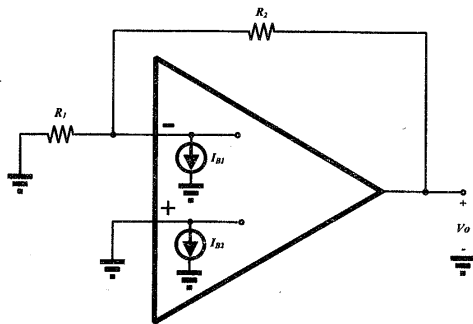


Fig. 1

2. If V_1 , V_2 , V_3 and V_4 are the input signals, V_o is the output signal, please use only one operational amplifier to design a circuit with the following function. (20分)

$$V_o = -(V_1 + 2V_2) + V_3 + 2V_4$$

3. In Fig. 2(a), if the transistor parameter $\beta = 100$, and the input signal waveform is shown in Fig. 2(b).

- (a) Determine the voltage gain. (10分)
- (b) Sketch the signal waveform at the output including the amplitude. (10分)

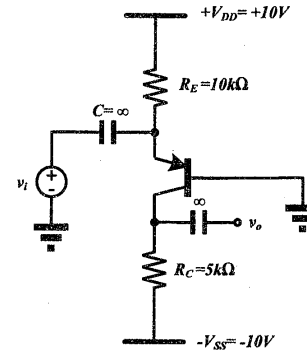


Fig. 2(a)

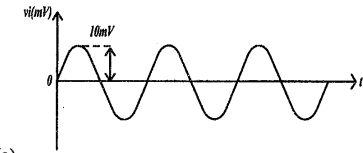


Fig. 2(b)

4. In Fig. 3, if the threshold voltage $V_t = 1.5 \text{ V}$, the early voltage $V_A = 50 \text{ V}$, $\mu_n C_{ox}(W/L) = 0.25 \text{ mA/V}^2$.

- (a) Determine the voltage gain. (10分)
- (b) Find the input resistance R_{in} . (10分)

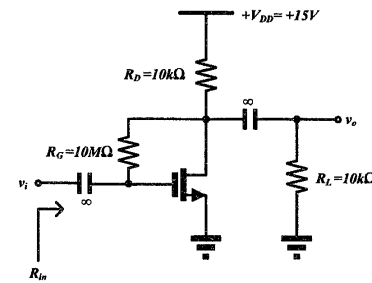


Fig. 3

5. The small-signal equivalent circuit is shown in Fig. 4, please use the Miller theorem to find the two poles. (20分)

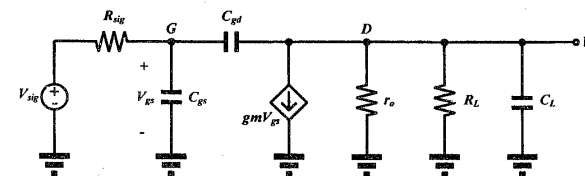


Fig. 4