題號： 310
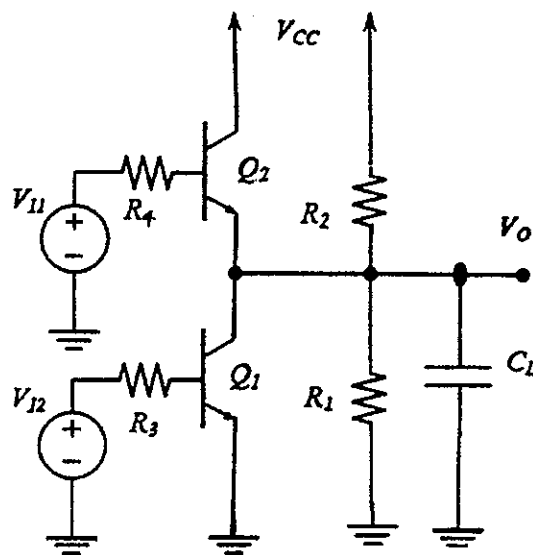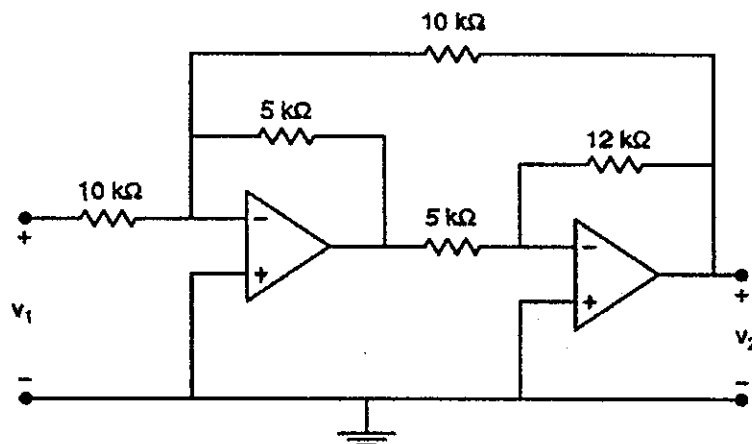科目： 電子學(B)
節次： 4

國立臺灣大學 111 學年度碩士班招生考試試題

題號：310

共 1 頁之第 1 頁

1. (30%) Consider the following BJT circuit with $V_{CC} = 5V$, $R_1 = R_2 = 1 k\Omega$, $R_3 = R_4 = 100 \Omega$, $C_L = 5 \mu F$, $\beta_{Q1} = \beta_{Q2} = 100$, please find $V_O$ in the following two conditions, respectively:

   (a) $V_{I1} = 0V$ and $V_{I2} = 5V$

   (b) $V_{I1} = 5V$ and $V_{I2} = 0V$



2. (20%) Please use CMOS circuits to implement the function: $Y = \bar{A} \cdot (B+C)$, where the symbol $\bar{A}$ means the inversion of the signal A and the symbols "·" and "+" stand for the AND logic and the OR logic, respectively.

3. (25%) (a) Provide a design of 'source follower' using NMOS transistors. (b) Find the input resistance and the output resistance of your source follower. (c) What is the voltage gain of your source follower? (d) Please explain how you can bias the transistor circuit using a constant-current source. (e) Please provide a circuit that implements the current source using NMOS transistors.

4. (10%) The circuit shown in the following figure is the simplest shunt voltage regulator using a Zener diode of breakdown voltage 6 V. What is the power dissipated in the Zener diode?
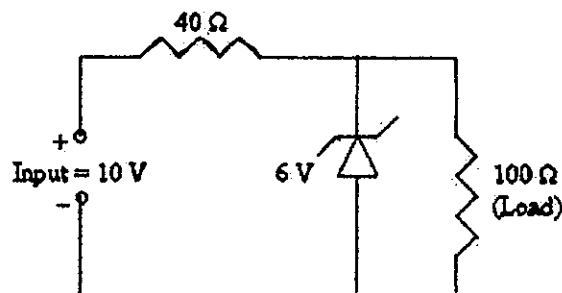


5. (15%) Please solve $V_2$ in the following circuit. Assume the operational amplifiers are ideal.



試題隨卷繳回