1. For the circuit shown below, $R_1 = 8\ \text{k}\Omega$, $R_2 = 2\ \text{k}\Omega$.
   (a) Assume the op-amp has infinite gain, what is its voltage gain, $A_v = \frac{V_{out}}{V_{in}}$? **[5%]**
   (b) If the gain of op-amp is not ideal, $A_0 = 500$, what is the gain error of A_v in (a)? **[10%]**

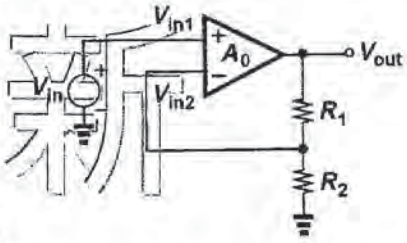


Fig. 1

2. Assume the op-amp in the circuit operates ideally, what is the output voltage, V_{out}? **[5%]**

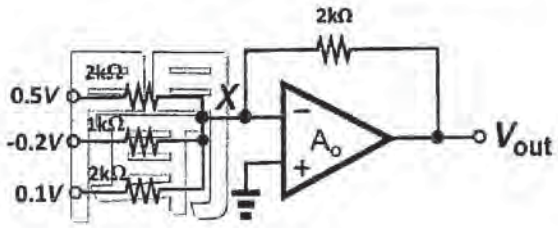


Fig. 2

3. Assume the gain of the op amp in the circuit is infinite.
   (a) Derive the transfer function, $H(s) = V_{out}(s)/V_{in}(s)$. **[10%]**
   (b) Plot the response, $|H(j\omega)|$ *vs.* ω, for the case $R_1C_1 \ll R_2C_2$. **[10%]**

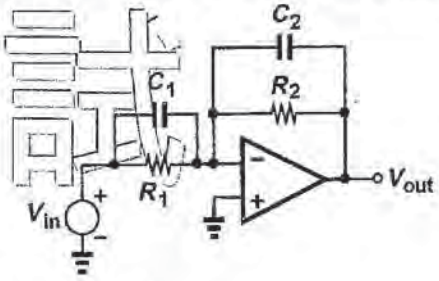


Fig. 3

4. Assume the gain of the op amp in the circuit is infinite.
   (a) Derive the transfer function, $H(s) = V_{out}(s)/V_{in}(s)$. **[10%]**
   (b) What type of filter does it belong to? **[5%]**

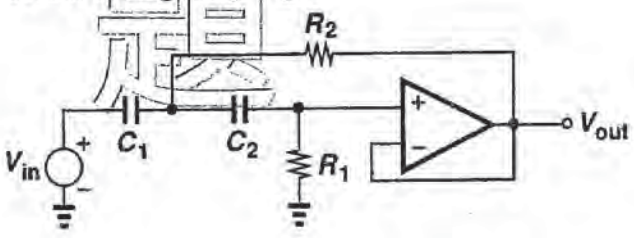


Fig. 4

科目：電子學二(電路) 適用：電機系

編號：462

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。
3.限用藍、黑色筆作答；試題須隨卷繳回。

5. The CMOS inverter with its voltage transfer characteristic plot is shown below. There are five working regions as labeled in the plot. What are the operation modes of the MOSFET M1 and M2 for the five regions? (Answer with OFF, Triode, Saturation). **[10%]**

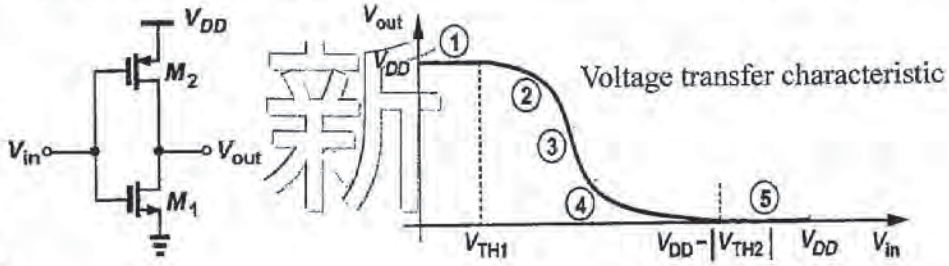


Fig. 5

6. Determine the logical function of the following two circuits. **[10%]**

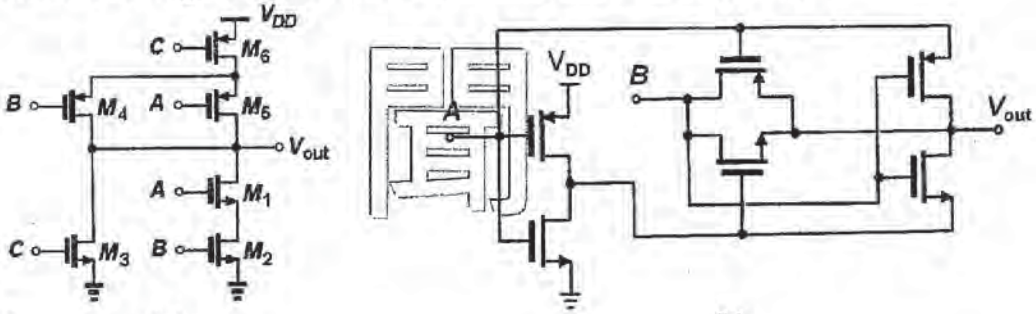


Fig. 6 (a) (b)

7. Determine the feedback polarity of the following circuits. (Answer with positive or negative) **[5%]**

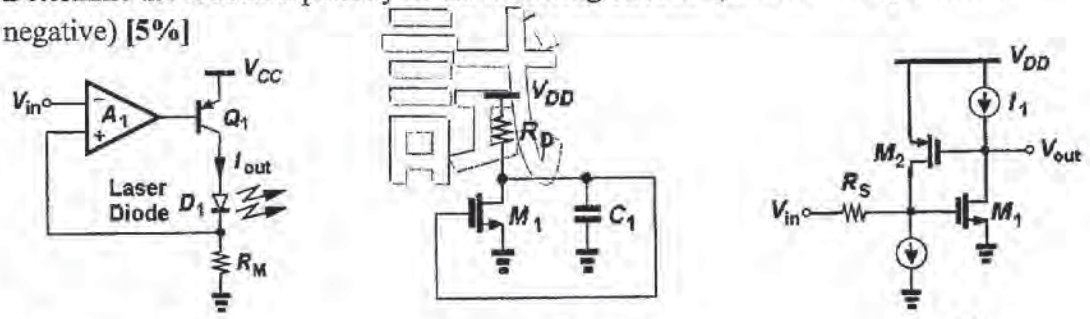
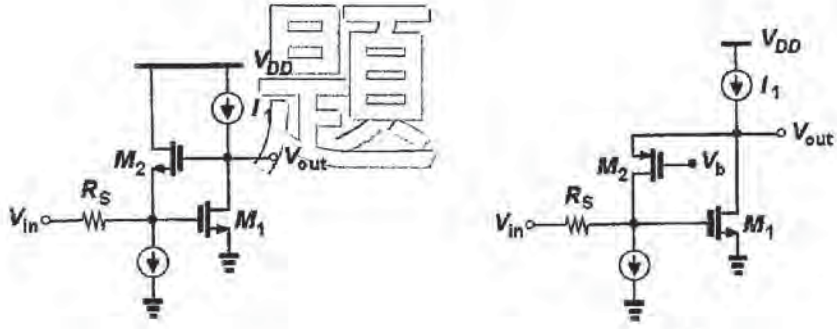


Fig. 7 (a) (b) (c)



(d) (e)

8. For the circuit shown below, where A_1 is the open-loop gain of the op-amp and M_3's λ is 0, find its closed-loop gain, input impedance, and output impedance **[10%]**

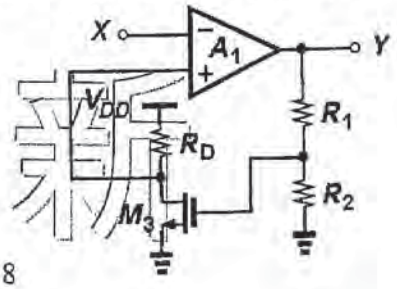


Fig. 8

9. Plot the Bode plot of magnitude for the transfer function listed below. **[10%]**

$$H(s)=10^4\cdot\frac{\left(1+\frac{s}{10^3}\right)}{\left(1+\frac{s}{10}\right)\left(1+\frac{s}{10^5}\right)}$$