

## 電子學(一) HW6

1. The overall voltage gain of a CS amplifier ( $\lambda = 0$ ) with a drain resistance  $R_D$  and resistance  $R_S = 0.5 \text{ k}\Omega$  in the source lead was measured and found to be  $-10 \text{ V/V}$ . When  $R_S$  was shorted, but the circuit operation remained linear, the gain doubled. What must  $g_m$  be? What value of  $R_S$  is needed to obtain an overall voltage gain of  $-16 \text{ V/V}$ ?
  
2. A CG amplifier using an NMOS transistor for which  $g_m = 2 \text{ mA/V}$ ,  $\lambda = 0$  has a  $5\text{-k}\Omega$  drain resistance  $R_D$  and a  $5\text{-k}\Omega$  load resistance  $R_L$ . The amplifier is driven by a voltage source having a  $750\text{-}\Omega$  resistance. What is the input resistance of the amplifier? What is the overall voltage gain  $A_v$ ?
  
3. An NMOS transistor is connected in the bias circuit of Fig. 7.48, with  $V_G = 5 \text{ V}$  and  $R_S = 3 \text{ k}\Omega$ . The transistor has  $V_t = 1 \text{ V}$  and  $k_n = 2 \text{ mA/V}^2$ . What bias current results? If a transistor for which  $k_n$  is 50% higher is used, what is the resulting percentage increase in  $I_D$ ?

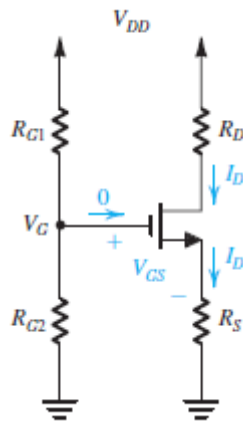
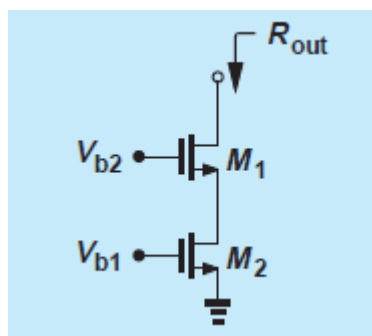
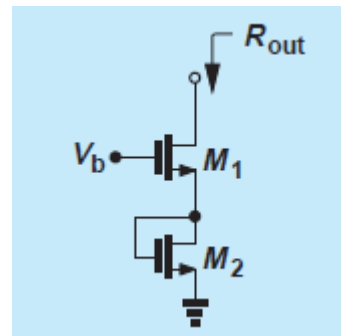


Fig. 7.48

4. Compute the output resistance of the circuit in Fig. 7.18 (a)&(b) if  $M_1$  and  $M_2$  are identical.



(a)



(b)

Fig. 7.18