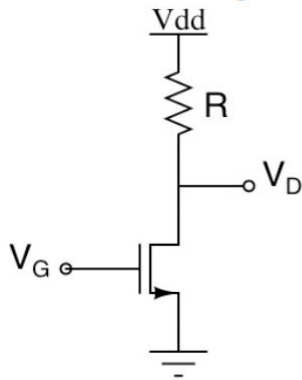


國立高雄海洋科技大學 101 年度碩士班考試入學
微電子工程研究所- 微電子學試題(※須使用計算機)

1. For the following circuit, find the drain voltage V_D for each case. (MOS in saturation) 15%

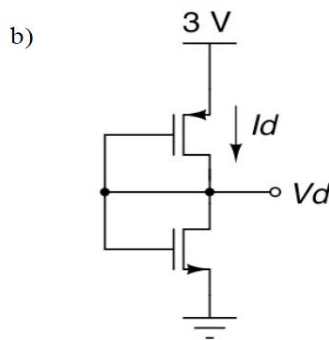
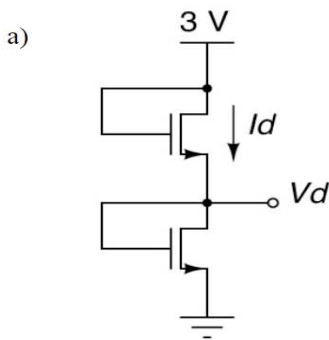


$W/L = 10$
 $\mu_n C_{ox} = 20 \mu A/V^2$
 $V_{Tn} = 2 V$
 $\lambda_n = 0.05 V^{-1}$
 $\gamma_n = 0$

 $R = 20 k\Omega$

- a) $V_{dd} = 10 V, V_G = 3 V$
- b) $V_{dd} = 20 V, V_G = 3 V$
- c) $V_{dd} = 20 V, V_G = 4 V$

2. For the following circuits, find the labeled currents and voltages (I_d and V_d). 20%



For NMOS and PMOS,

$W/L = 30 \mu m/10 \mu m$
 $\mu_n C_{ox} = 50 \mu A/V^2$
 $\mu_p C_{ox} = 20 \mu A/V^2$
 $|V_T| = 1 V$
 $\lambda = 0$
 $\gamma = 0$

3. The bias voltages in the circuit shown in Fig. 3 are $V^+ = 5V$ and $V^- = -5V$. Assume the $\beta=80$.

Determine I_B, I_C, I_E and V_{EC} . (20%)

4. For the circuit in Fig. 4, let $\beta = 125, V_{BE(on)} = 0.7V$, and $V_A = 200V$. (a) Determine the small-signal voltage gain A_v . (b) Determine the output resistance R_o . (20%)

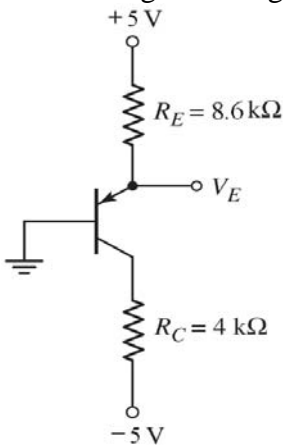


Fig. 3

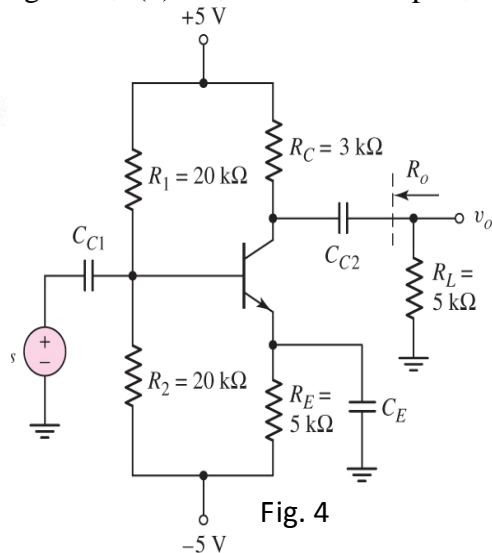


Fig. 4

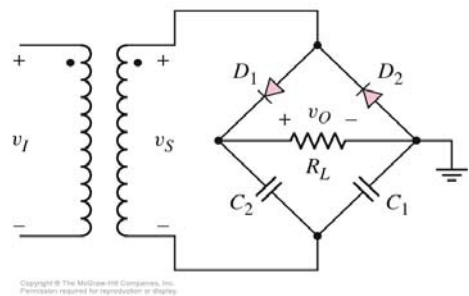


圖 5

5. 如何證明圖 5 為倍壓電路?10%

6. (a) 試解釋造成半導體內的載子移動所形成的電流機制為哪兩種?動作原理分別為何? 7%

(b) 分別以電子與電洞加以闡述在這兩機制中是如何移動方向與相對貢獻電流的? 8%