逢甲大學104學年度碩士班考試入學試題

編號：054　科目代碼：325

科目	電子學	適用系所	通訊工程學系	時間	100 分鐘

※請務必在答案卷作答區內作答。　　共 2 頁第 1 頁

＊ For NMOS in triode region: $i_D = k'_n \frac{W}{L}[(v_{GS} - V_t)v_{DS} - \frac{1}{2}v_{DS}^2]$, $k'_n = \mu_n C_{ox}$

in saturation region: $i_D = \frac{1}{2}k'_n \frac{W}{L}(v_{GS} - V_t)^2(1 + \lambda v_{DS})$

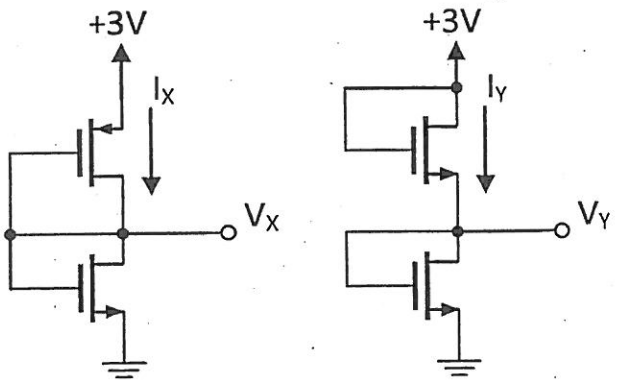
$$g_m = k'_n \frac{W}{L}(v_{GS} - V_t) = \frac{2I_D}{V_{GS} - V_t}$$

＊ For PMOS in triode region: $i_D = k'_p \frac{W}{L}[(v_{SG} - |V_t|)v_{SD} - \frac{1}{2}v_{SD}^2]$ $k'_p = \mu_p C_{ox}$

in saturation region: $i_D = \frac{1}{2}k'_p \frac{W}{L}(v_{SG} - |V_t|)^2(1 + |\lambda| v_{SD})$

$$g_m = k'_p \frac{W}{L}(v_{SG} - |V_t|) = \frac{2I_D}{V_{SG} - |V_t|}$$

1. For the circuits shown in Fig. 1 (a) and (b), $\mu_n C_{ox} = 2.5\mu_p C_{ox} = 20\frac{\mu A}{V^2}$, $|V_t|$=1V, $\lambda = 0$, $\frac{W}{L} = 3$. Find the values of I_X, V_X, I_Y, and V_Y. (16%)



(a)　　(b)

Fig. 1

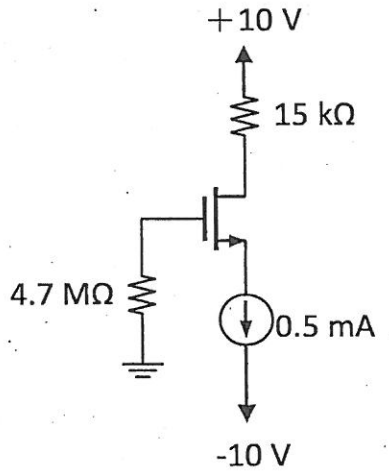


Fig. 2

2. Consider the circuit of Fig. 2, V_t=1.5V, and $k'_n\left(\frac{W}{L}\right) = 1\ mA/V^2$. Find V_G, V_S, and V_D. (15%) Also, calculate the values of g_m and r_o, assuming that V_A=75V. (4%)

3. A series-shunt feedback amplifier circuit shown in Fig. 3. It is required to analyze this amplifier to obtain its voltage gain V_o/V_s, input resistance R_{in} and output resistance R_{out}. If $g_{m1}=g_{m2}$=4 mA/V, neglect r_o of each of Q_1 and Q_2. (15%)

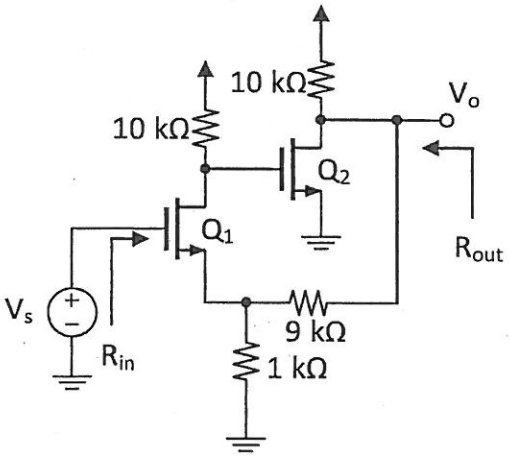


Fig. 3

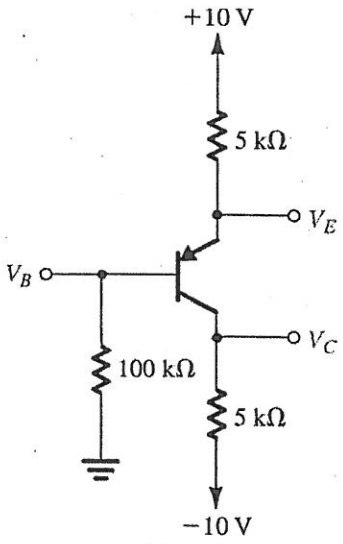


Fig. 4

4. In the circuit shown in Fig. 4, measurement indicates V_B to be +1.0 V and V_E to be +1.7 V.
   (a) What are α and β for this transistor? (10%)
   (b) What voltage V_C do you expect at the collector? (5%)

5. We wish to analyze the transistor amplifier shown in Fig. 5. Assume $\beta = 100$.
   (a) Find I_B, I_C, V_C. (9%) (b) Find r_e, g_m, r_π. (9%) (c) Find $A_v = v_o \div v_i$. (7%)

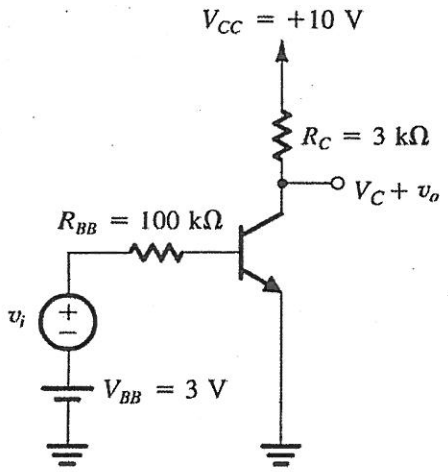


Fig. 5

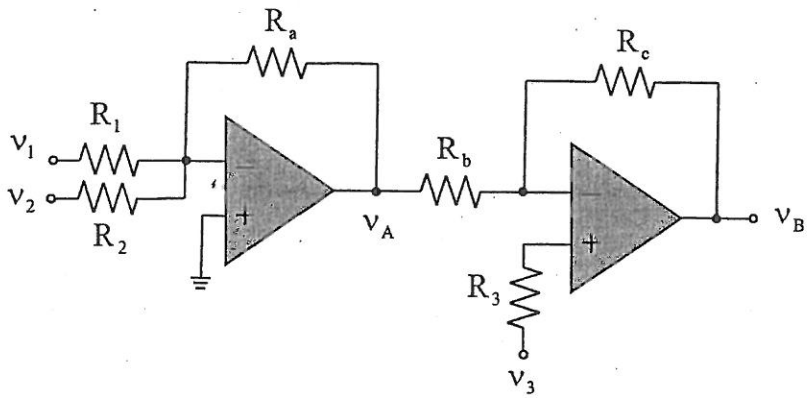


Fig. 6

6. We wish to analyze the operational amplifier shown in Fig. 6.

   (a) Find v_A. (5%) (b) Find v_B. (5%)