國立成功大學 工程科學系 試題

電子電路（總分 100 分）　　　　　　學號＿＿＿＿＿　姓名＿＿＿＿＿　2018/1/15

計算題 5 題(100 分，共 3 頁) 推導過程須要詳細寫出來，若觀念正確，才能斟酌給分。

1. The CG amplifier circuit shown in Fig.1 have $g_m = 2\text{mA/V}$, $r_o = \infty$, and $C_{gs} = 1pF$, $C_{gd} = 2pF$. Please determine the midband gain $A_M \equiv \dfrac{v_o}{v_{sig}}$, and the upper 3-dB frequency f_H in case $R_{sig} = 2k\Omega$, $R_L = 10k\Omega$, and $C_L = 10pF$, and neglect r_o.(20%)
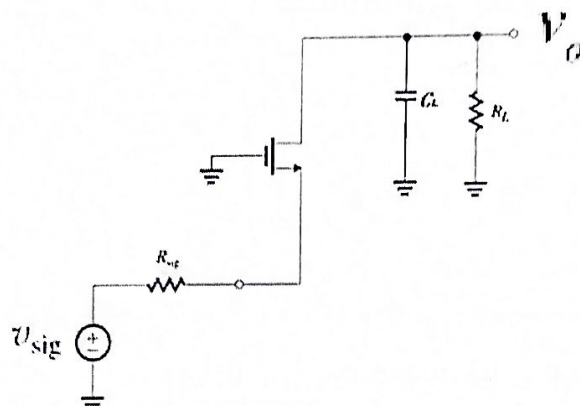

Fig.1

2. For the circuit in Fig.2, let $\beta = 100$, $C_\mu = 2pF$, $C_\pi = 6pF$, and neglect r_o. Calculate the midband gain $A_M \equiv \dfrac{v_o}{v_{sig}}$, and the upper 3-dB frequency f_H. (20%)
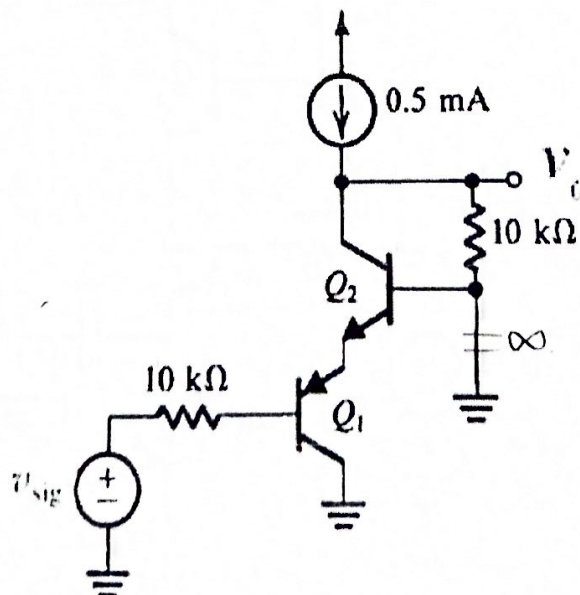

Fig.2

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3. The CS amplifier in Fig.3 has $g_m = 2mA/V$, $C_{gs} = C_{gd} = 1pF$, $R = 100k\Omega$, $R_G = 1.2M\Omega$, $R_L = 12k\Omega$, and neglect r_o. Use the method of open-circuit time constants to obtain f_H.(20%)
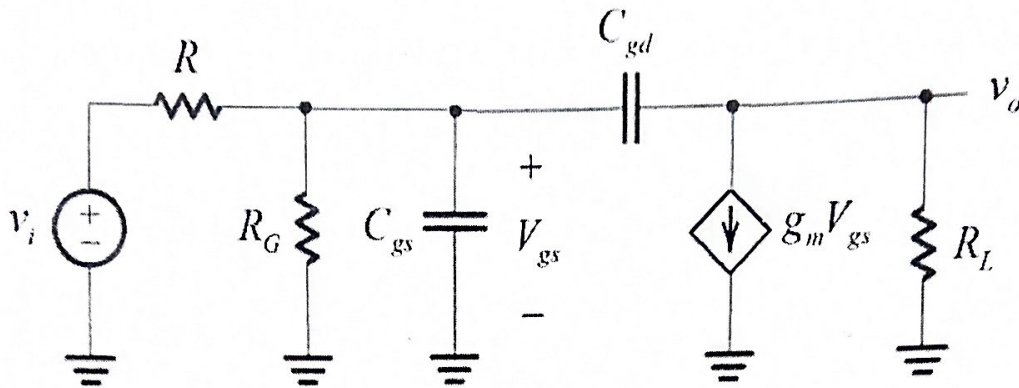

Fig.3

4. In the Fig.4, let $\beta = 100$, $C_\mu = 2pF$, $C_\pi = 6pF$, and neglect r_o. Please calculate the midband gain A_M and 3-dB frequency f_H.(20%)
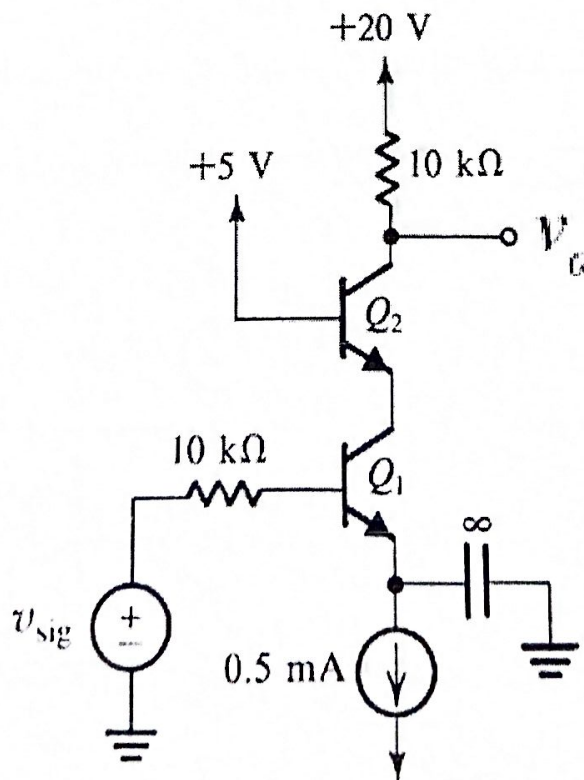

Fig.4

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5. Consider the common-emitter amplifier of Fig.5 under the following conditions:

$R_{sig} = 5k\Omega$, $R_1 = 33k\Omega$, $R_2 = 22k\Omega$, $R_E = 3.9k\Omega$, $R_C = 4.7k\Omega$, $R_L = 6k\Omega$,

$V_{CC} = 5V$, $\beta = 100$, and neglect r_o.

(a) Calculate the mid-band voltage gain.

(b) If $C_{C1} = C_{C2} = C_E = 1\mu F$, determine the lower 3-dB frequency.

(c) If the BJT is $C_\pi = 2.4$ pF, and $C_\mu = 1$pF, determine the upper 3-dB frequency.

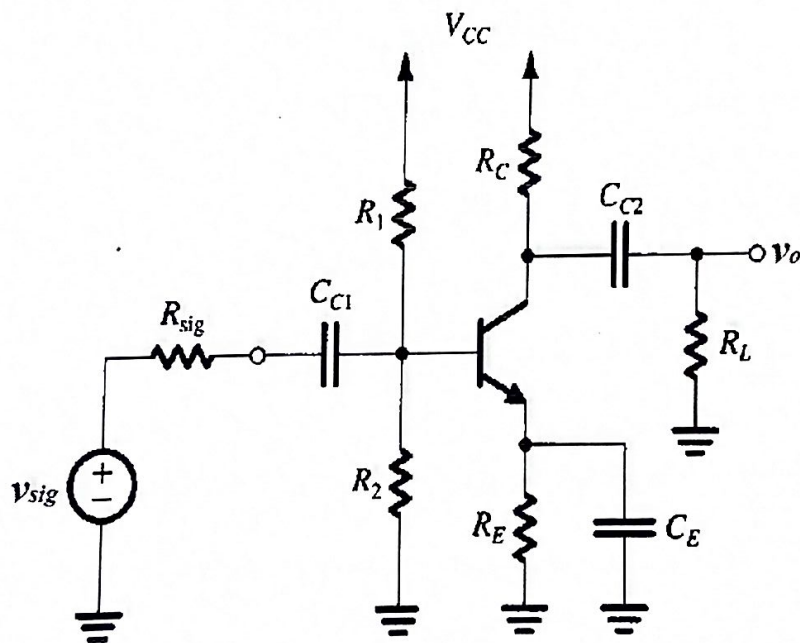(Using Miller theorem, $f_H \approx Miller's\ dominant\ pole$).

Fig.5