國立中山大學100學年度碩士班招生考試試題

科目：電子學【通訊所碩士班乙組】

1. (25%) Consider a source follower such as that in Fig. 1 Specifically,
   (a) Please derive R_{in}, A_{vo}, A_v, and R_o with r_o taken into account.   (4*5%)
   (b) Please derive the overall small-signal voltage gain G_v with r_o taken into account.   (1*5%)
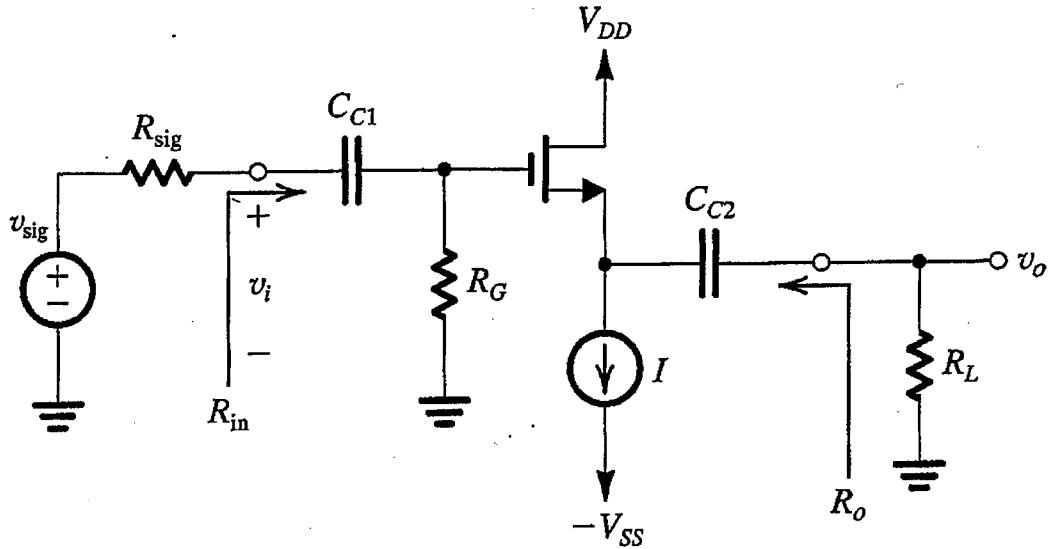

Fig. 1

2. (20%) Please find the three break frequencies and the low *3dB* frequency of the common emitter amplifier with an emitter resistance as shown in Fig. 2.   (4*5%)
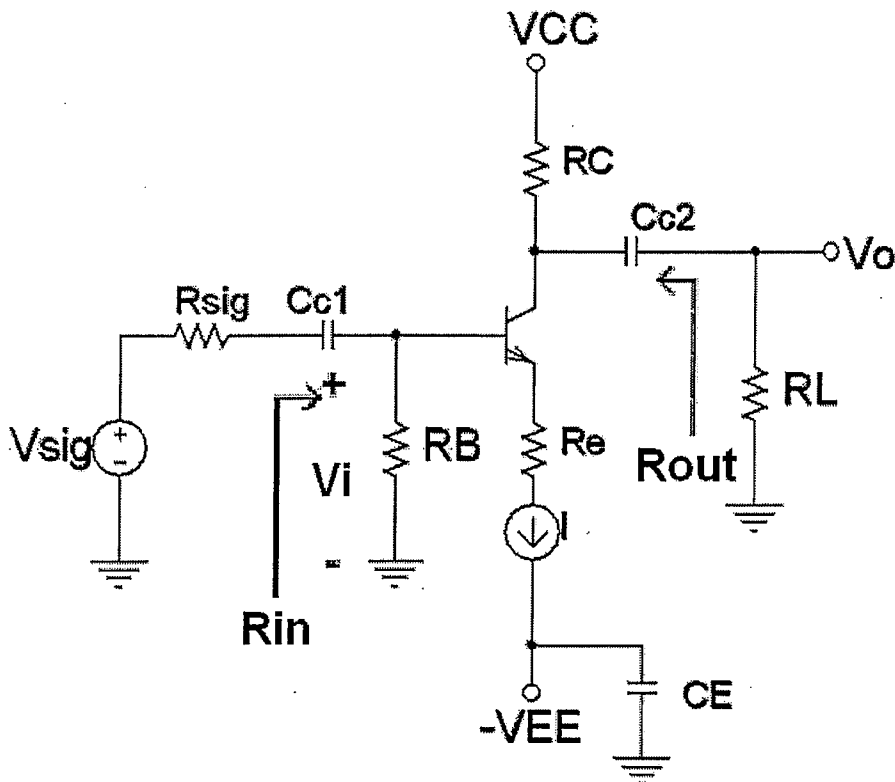

Fig. 2

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3. (20%) Design and draw a three input CMOS NAND and CMOS NOR gates respectively. Also, please find out the $(W/L)_P/(W/L)_N$ ratios of the designed CMOS NAND and CMOS NOR gates respectively so that their PMOS part and NMOS part have same MOS transconductance parameters, where W/L is aspect ratio.

(2*5%, 1*10%)

4. (15%) In Fig. 4, given that the input resistance is 10 KΩ and the differential voltage gain is 100, please find out (a) $R_1 = R_3 = ?$, and (b) $R_2 = R_4 = ?$ (2*7.5%)
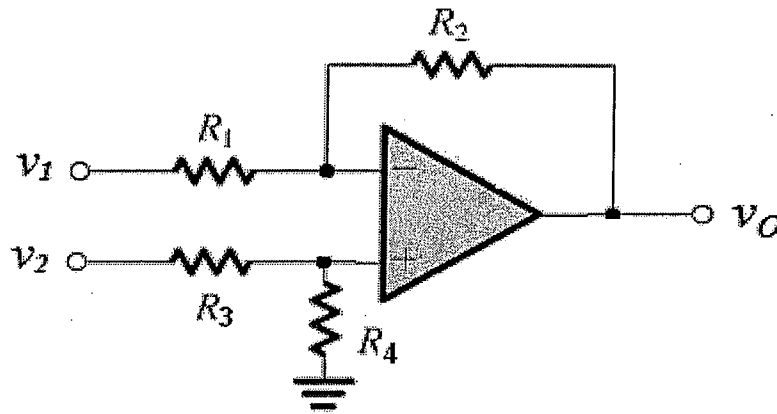

Fig. 4

5. (20%) Fig. 5 shows an operation amplifier and its small equivalent circuit. Please derive its output resistance R_o and its dc open-loop gain A_v with respect to the circuit transistor's g_m and r_o.
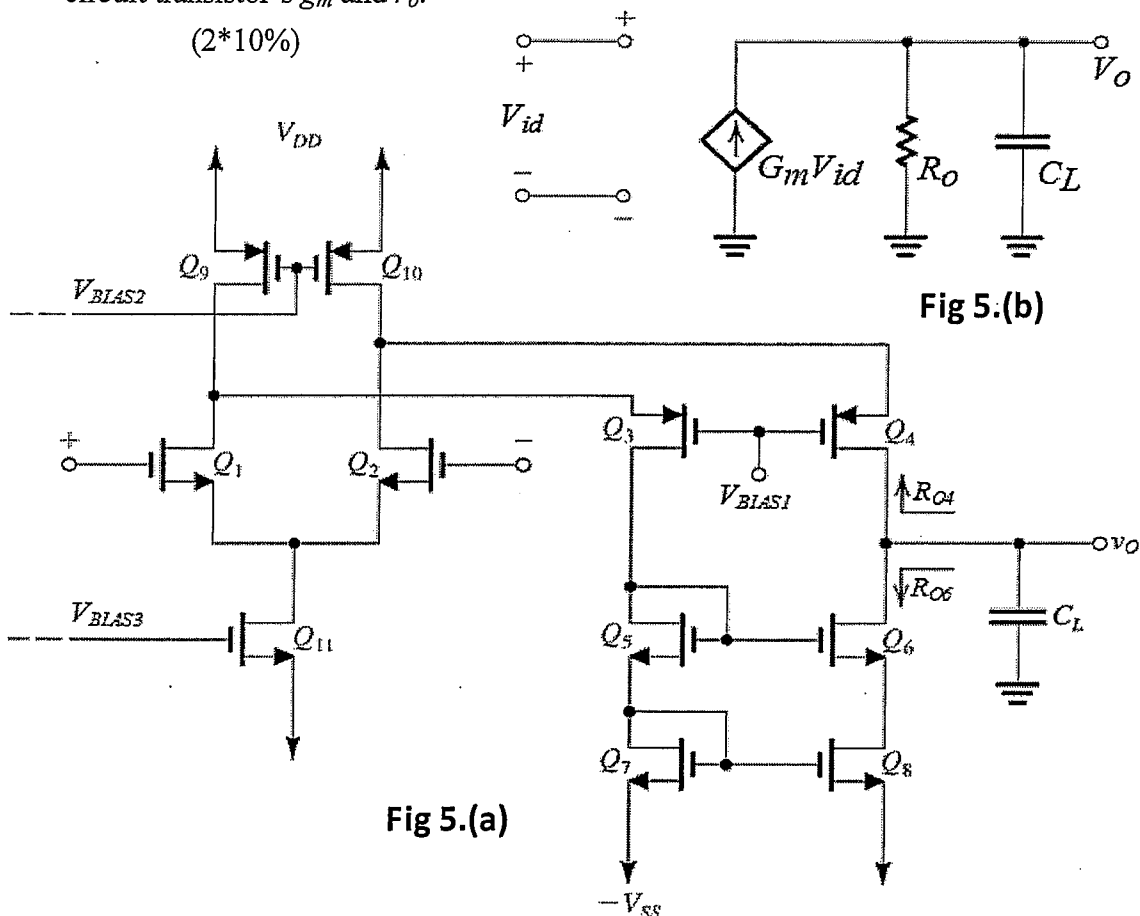
(2*10%)

Fig 5.(b)

Fig 5.(a)