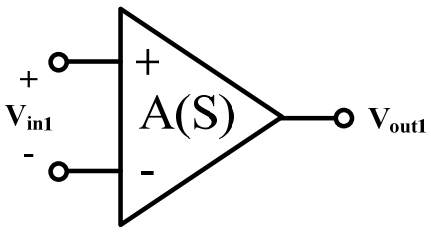
系級班別：_____ 學號：_____ 姓名：_____

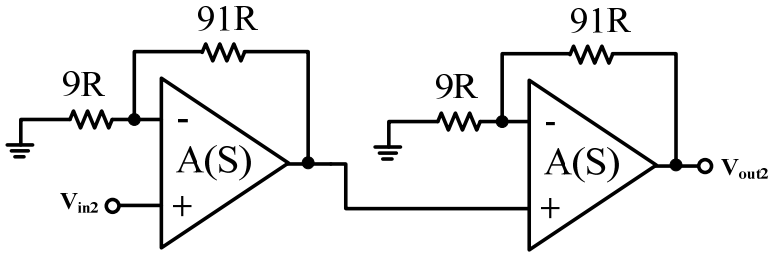
1. (a) With less than 25 words to list the name of the four feedback amplifiers (e.g. Trans… amplifier) and their corresponding topologies (e.g. series-shunt). (12%)
(b) Show how to derive A circuit and β circuit for a voltage amplifier. (8%)

2. A single-pole amplifier as shown in Fig.2(a) is designed to have a low-frequency gain of 100 and a pole at 10^6 Hz (i.e. $2\pi\times10^6$rad/sec). The single-pole amplifier (transfer function=A(S)) is used to design a feedback amplifier (transfer function=A_F(S) as shown in Fig.2(b).
(a) Derive A(S)) and draw its Bode plot. (4%) (b) What's the feedback type of the internal stage of the feedback amplifier? β for the internal stage=? (8%) (c) Derive A_F(S) and draw its Bode plot. (4%) (d)If the gain of the single-pole amplifier is decreased by 20%, what is the corresponding gain decrease in the feedback amplifier? (4%)



$$A(S)=\frac{V_{out1}(S)}{V_{in1}(S)}$$

Fig. 2(a)



$$A_F(S)=\frac{V_{out2}(S)}{V_{in2}(S)}$$

Fig. 2(b)

3. With less than 20 words, please give definitions for the following items of an operation amplifier.
(a) Slew Rate (7%)
(b) Unity-Gain-Band-Width (6%)
(c) Amplifier with rail-to-rail input operation (7%)

4. For a particular design of the two-stage CMOS op amp of Fig. 4. (Numerical answer is required.)
(a) ±1.65-V supplies are utilized and all transistors except for M6 and M7 are operated with overdrive voltages of 0.35-V magnitude; M6 and M7 use overdrive voltages of 0.45-V magnitude. The fabrication process employed provides $V_{tn}=|V_{tp}|$=0.5-V. Find the input common-mode range and the range allowed for v_o. (10%)
(b) With the process parameter $V'_{An}=|V'_{Ap}|$=20V/μm. Find A_1, A_2, and Av if all devices are 1μm long, V_{ov1}=0.2-V, and V_{ov6}=0.5-V. Also, find the op-amp output resistance obtained when the second stage is biased at 0.45mA. (A_1 and A_2 represent the A of the first and the second stage, respectively) (10%)

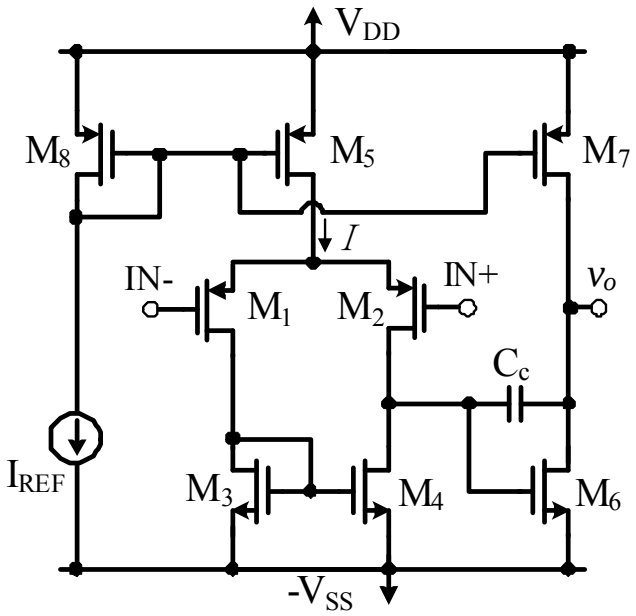


Fig. 4

5. As shown in Fig. 5, for the folded-cascode op amp utilizing power supplies of ±1.65-V, find the values of V_{BIAS1}, V_{BIAS2}, and V_{BIAS3} to maximize the allowable range V_{ICM} and v_o. Assume that all transistors are operated at equal overdrive voltages of 0.2-V. Assume $|V_t|$ for all devices is 0.5-V. Specify the maximum range of V_{ICM} and of v_o. (20%)

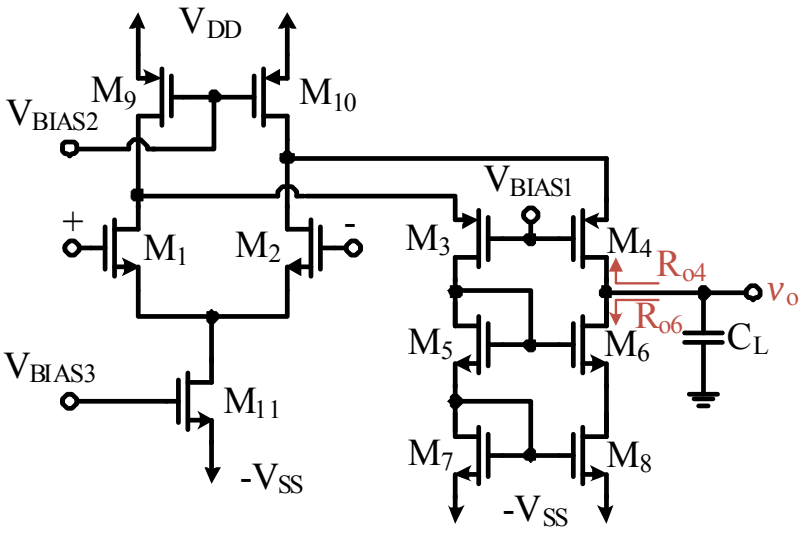


Fig. 5