國立雲林科技大學
97 學年度碩士班入學招生考試試題

系所：電子系
科目：電子學

1. Assuming the op amp to be ideal, derive an expression for the closed-loop gain v_{out}/v_{in} of the circuit shown in Fig. P1. (15%)

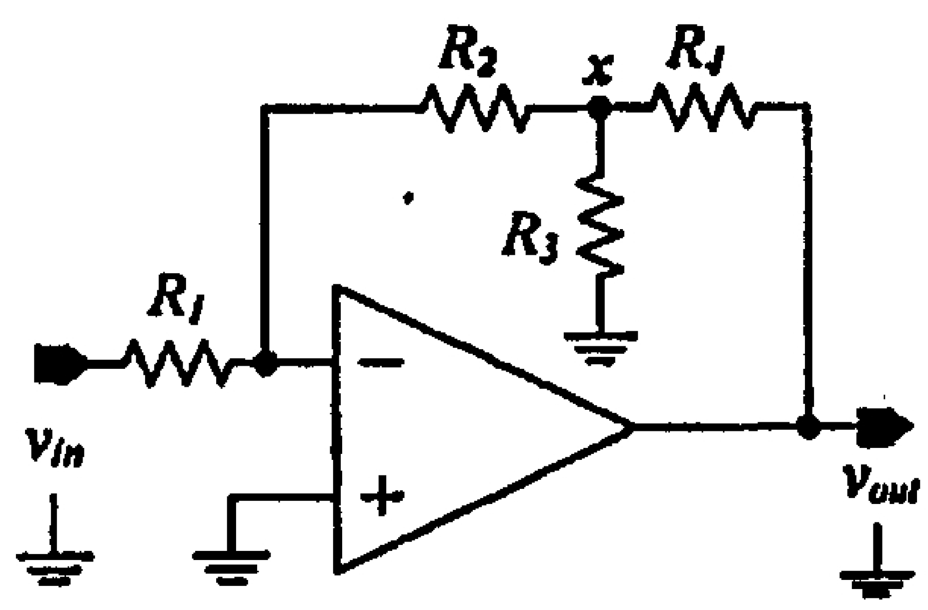

Fig. P1

2. For the circuit in Fig. P2, resistors R_1 to R_5 are set to be 2 KΩ.
   a. find the equivalent resistance to ground, R_{eq}, (5%)
   b. find the equivalent resistance R_{eq}, when R_4 reduced to 1.8 KΩ. (10%)

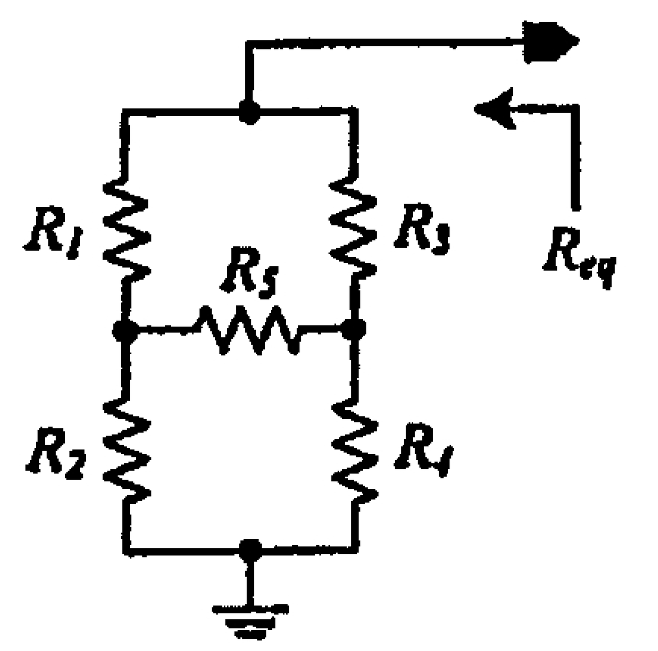

Fig. P2

3. Consider a peak rectifier fed by a 120 Hz sinusoid having a peak value $V_p = 3.3$ V. Let the load resistance $R = 100$ KΩ. Find the value of the capacitance C that will result in a peak-to-peak ripple of 0.1 V. (20%)

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4. Write down the small-signal voltage gain, Fig. P4. (10%)

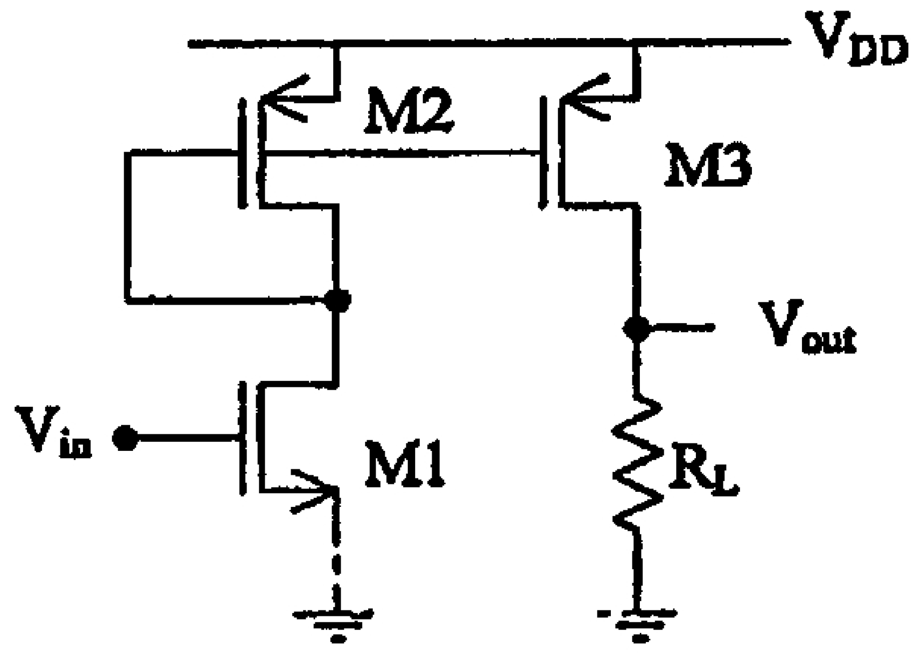

Fig. P4

5. An amplifier is shown in Fig. P5. Neglect the channel-length modulation and body effect of the transistors. The output impedance of M2 is much less than R_F. Find
(a) low-frequency closed-loop gain. (10%)
(b) closed-loop input impedance at low frequency. (10%)

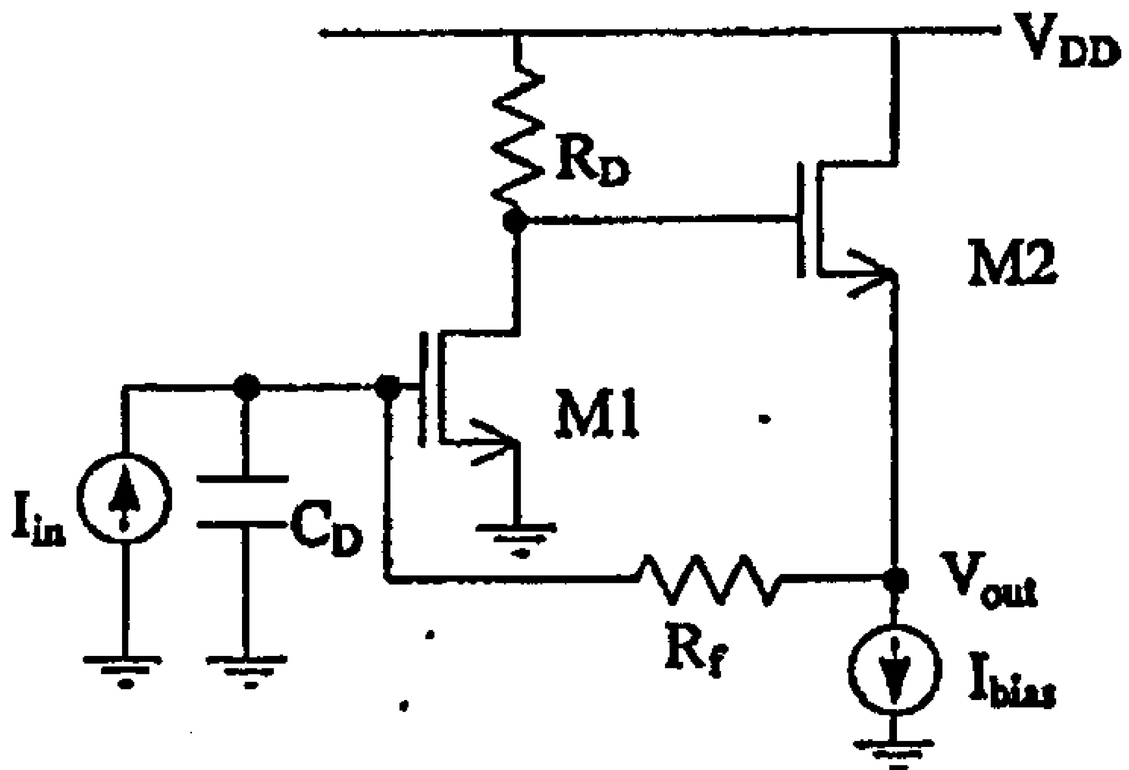

Fig. P5

6. For the circuit shown in Fig. P6, $\mu_n C_{ox} = 50\mu A/V^2$, $\lambda = 0V^{-1}$, $(\frac{W}{L})_{M1} = 40$,

$I_{bias} = 200\mu A$, $\gamma = 0.4V^{1/2}$, $|2\phi_F| = 0.7V$, $V_{DD} = 5V$, and $V_{t_0} = 0.6V$. λ is the channel-length modulation coefficient. γ is the body effect coefficient.
(a) Calculate V_{out} for $V_{in} = 1.2V$. (10%)
(b) If I_{bias} is to be implemented by an NMOS transistor, find its minimum value $(\frac{W}{L})$ such that the NMOS transistor remains in saturation. (10%)

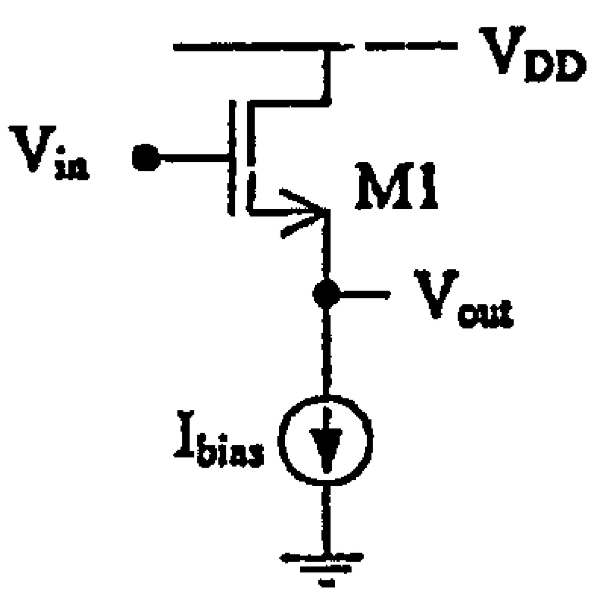

Fig. P6