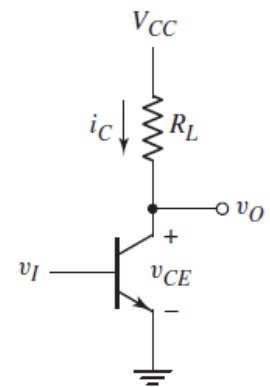


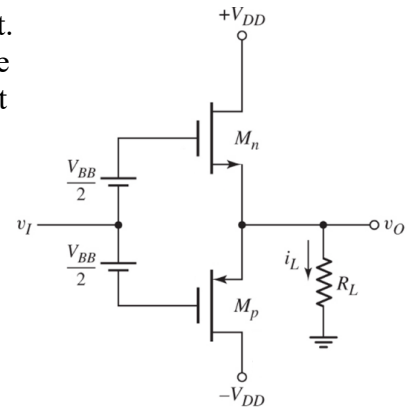
Electronics II, EXAM-2, Spring 2016
 Department of Communication Engineering, National Central University
 April 22, 2016, Prof. Dah-Chung Chang (E1-311)

1. (10%) For a power MOSFET, $\theta_{\text{dev-case}} = 1.5^\circ\text{C/W}$, $\theta_{\text{snk-amb}} = 2.8^\circ\text{C/W}$, and $\theta_{\text{case-snk}} = 0.6^\circ\text{C/W}$. The ambient temperature is 25°C .
- If the maximum junction temperature is limited to $T_{j,\text{max}} = 120^\circ\text{C}$, determine the maximum allowed power dissipation.
 - Using the results of part (a), determine the temperature of the case and heat sink.

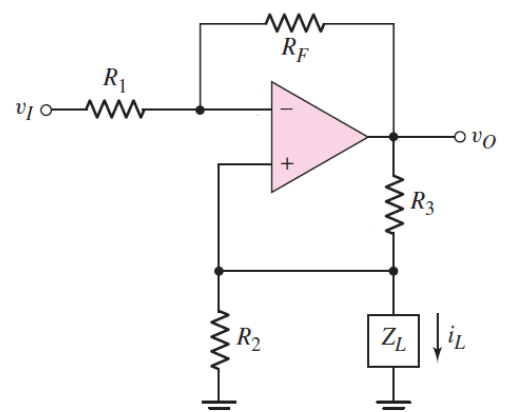
2. (20%) For the common-emitter output stage shown on the right, let $V_{CC} = 12\text{ V}$ and $R_L = 1\text{ k}\Omega$. Assume the transistor Q -point is in the center of the load line.
- Determine the quiescent power dissipated in the transistor.
 - Assume the sinusoidal output voltage is limited to a 9 V peak-to-peak value. Determine
 - the average signal power delivered to the load,
 - the power conversion efficiency, and
 - the average power dissipated in the transistor.



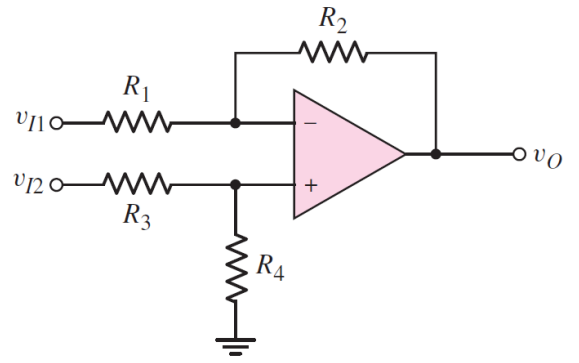
3. (15%) Consider the MOSFET class-AB output stage shown on the right. The circuit parameters are $V_{DD} = 15\text{ V}$ and $R_L = 25\Omega$. The transistors are matched with parameters $K = 0.25\text{ A/V}^2$ and $|V_T| = 1.2\text{ V}$. The quiescent drain currents are to be 20 percent of the load current when $v_O = 8\text{ V}$. Determine V_{BB} .



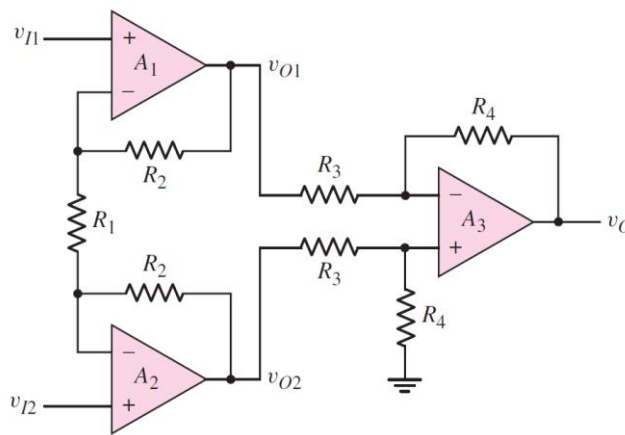
4. (15%) Find the condition such that the load current i_L is proportional to the input voltage v_I and is independent of the load impedance Z_L .



5. (15%) In the difference amplifier shown on the right, $R_1 = R_3 = 10\text{ k}\Omega$, $R_2 = 20\text{ k}\Omega$, and $R_4 = 21\text{ k}\Omega$. Determine the CMRR(dB).



6. (15%) Derive the output voltage v_O in terms of $v_{I2} - v_{I1}$.



7. (10%) What is the voltage gain v_O/v_I ?

