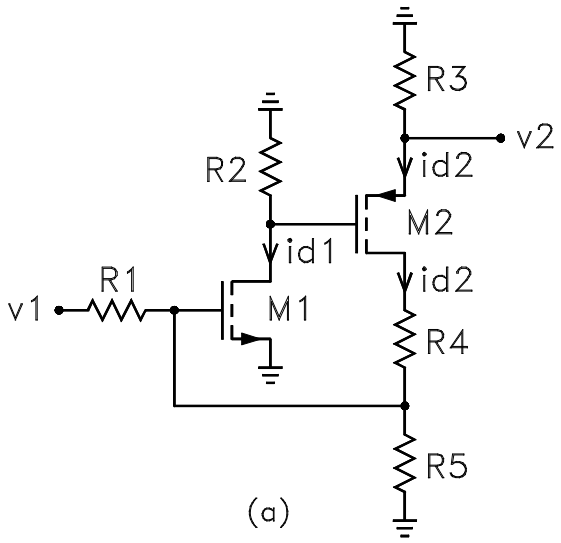
ECE 3050 Analog Electronics Quiz 10

July 28, 2010

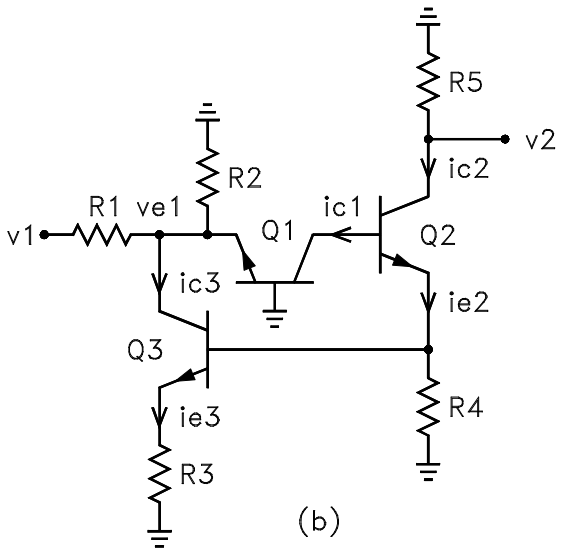
Professor Leach Name_____

Instructions. No calculators allowed on this quiz. Print your name in the space above. **Honor Code:** *I have neither given nor received help on this quiz.* Initials _____

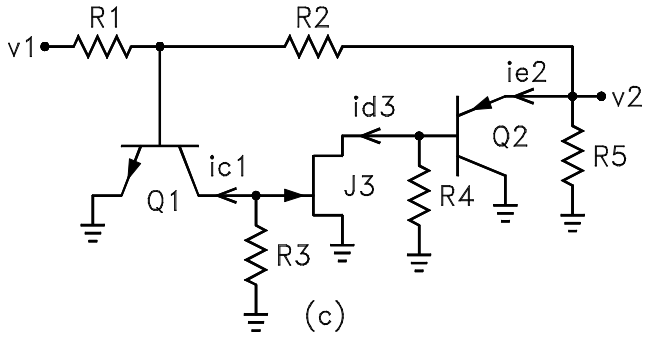
1. For the following four feedback amplifiers, signal trace the circuits and identify whether the feedback is negative or positive. (a) positive, (b) negative, (c) positive, (d) negative, (e) negative, (f) positive



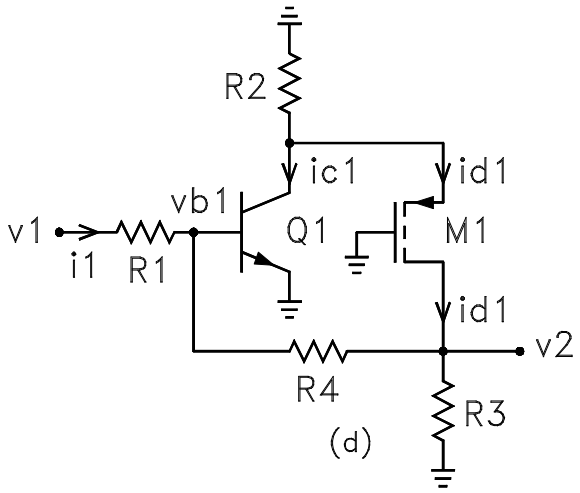
(a)



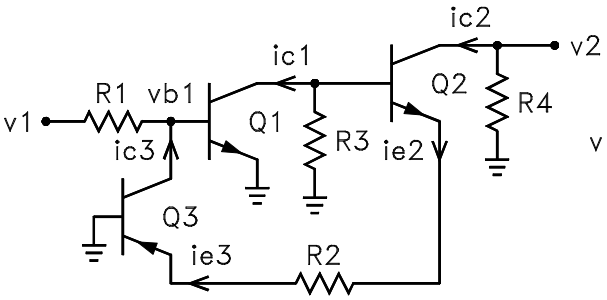
(b)



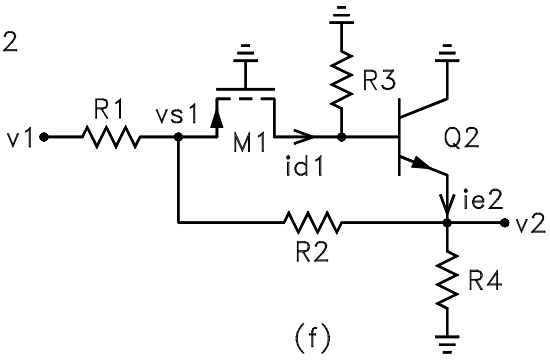
(c)



(d)



(e)

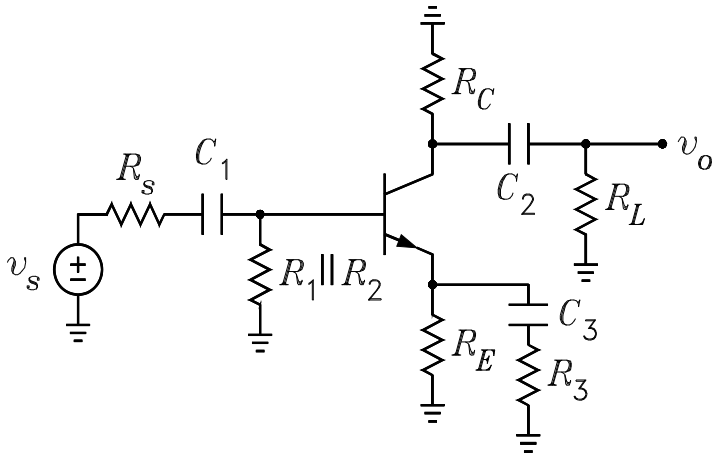


(f)

next page

2. The figure shows the signal circuit of a CE amplifier. Given: $R_s = 1.2\,\text{k}\Omega$, $R_1 = 51\,\text{k}\Omega$, $R_2 = 62\,\text{k}\Omega$, $R_C = 6.8\,\text{k}\Omega$, $R_L = 12\,\text{k}\Omega$, $R_E = 3.3\,\text{k}\Omega$, $R_3 = 330\,\Omega$, $C_1 = 0.22\,\mu\text{F}$, $C_2 = 1.2\,\mu\text{F}$, $C_3 = 330\,\mu\text{F}$, $r_\pi = 2.2\,\text{k}\Omega$, $\beta = 99$, $r_0 = \infty$, $r_{ib} = r_\pi + (1+\beta)\,R_{te}$, and $r_{ie} = (R_{tb} + r_\pi)\,/\,(1+\beta)$.

(a) Solve for the worst case high-pass pole frequency for C_1.
(b) Solve for the worst case high-pass pole frequency for C_2.
(c) Solve for the worst case high-pass shelving pole and zero frequencies for C_3.
(d) Solve for the worst case lower cutoff frequency f_L of the circuit.



$$r_{ib} = r_\pi + (1+\beta)\,R_E \| R_3 = 32.2\,\text{k}\Omega \qquad f_1 = \frac{1}{2\pi\,(R_s + R_1 \| R_2 \| r_{ib})\,C_1} = 44.7\,\text{Hz}$$

$$f_2 = \frac{1}{2\pi\,(R_C + R_L)\,C_2} = 7.06\,\text{Hz} \qquad r_{ie} = \frac{R_s \| R_1 \| R_2 + r_\pi}{1+\beta} = 33.5\,\Omega$$

$$f_{3p} = \frac{1}{2\pi\,(r_{ie} \| R_E + R_3)\,C_3} = 1.33\,\text{Hz} \qquad f_{3z} = \frac{1}{2\pi\,(R_E + R_3)\,C_3} = 133\,\text{mH}$$

$$f_L = \sqrt{f_1^2 + f_2^2 + f_{3p}^2 - 2f_{3z}^2} = 45.3\,\text{Hz}$$