

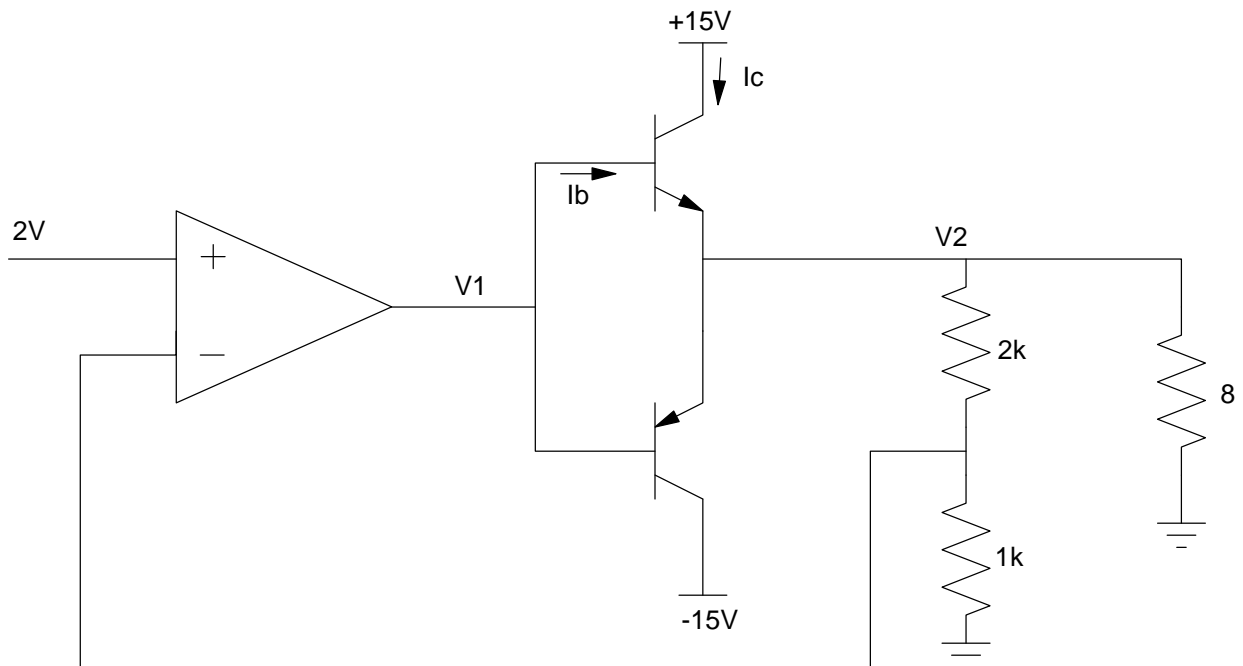
ECE 321: Final Exam Name _____

December 13, 2016

1) Determine the voltages and currents for the following push-pull amplifier with a +2V input. Assume

- $\beta = 100$
- $V_{be} = 0.7V$

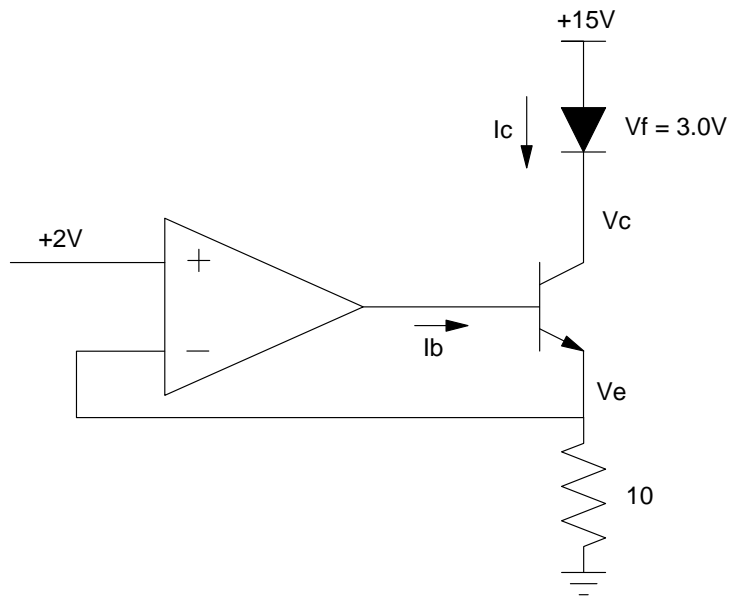
| V1 | V2 | Ib | Ic |
|----|----|----|----|
| | | | |



2) Determine the voltages and currents for the following circuit. Assume

- $\beta = 100$
- $V_{be} = 0.7V$
- $V_f = 3.0V$ (a white LED)

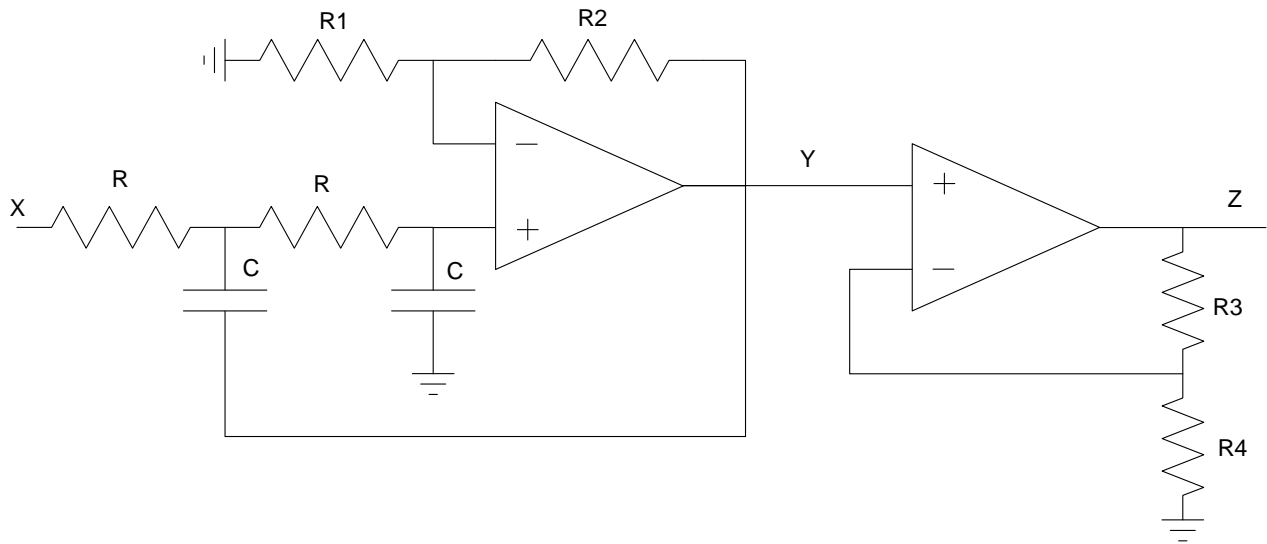
| Ib | Ic | Vc | Ve |
|----|----|----|----|
| | | | |



3) Find R and C so the the following amplifier has the following transfer function

$$Y = \left(\frac{1000}{s^2 + 10s + 300} \right) X$$

| R | C | R1 | R2 | R3 | R4 |
|---|---|----|----|----|----|
| | | | | | |



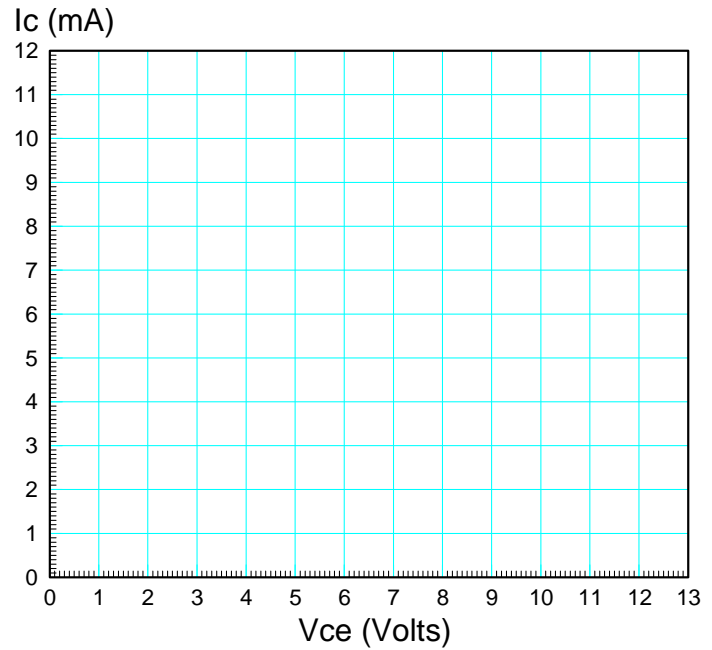
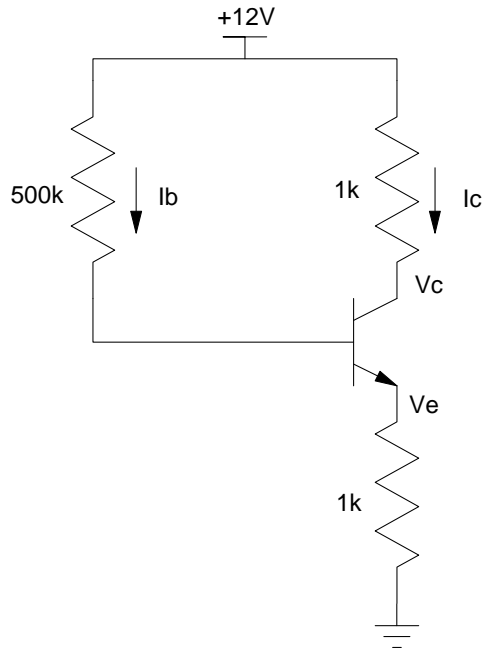
$$Y = \left(\frac{k \left(\frac{1}{RC} \right)^2}{s^2 + \left(\frac{3-k}{RC} \right) s + \left(\frac{1}{RC} \right)^2} \right) X$$

$$k = 1 + \frac{R_2}{R_1}$$

$$Z = \left(1 + \frac{R_3}{R_4} \right) Y$$

4) BJT and Load Lines: Determine the voltages and currents for the following circuit. Also draw the load line and show the Q-point on the load-line. Assume $\beta = 100$

| I _b | I _c | V _c | V _e | Load Line & Q-Point |
|----------------|----------------|----------------|----------------|---------------------|
| | | | | show on graph |

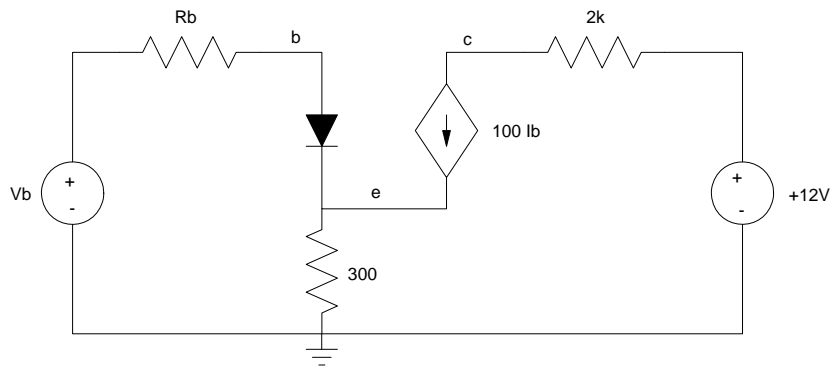
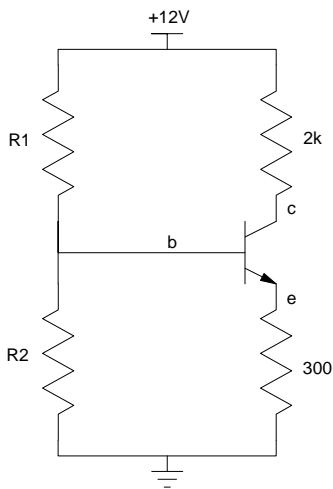


5) Find R1 and R2 so that

- The Q-point is stabilized for variations of β ($(1 + \beta)R_e \gg R_b$) and
- $V_{ce} = 6.0V$

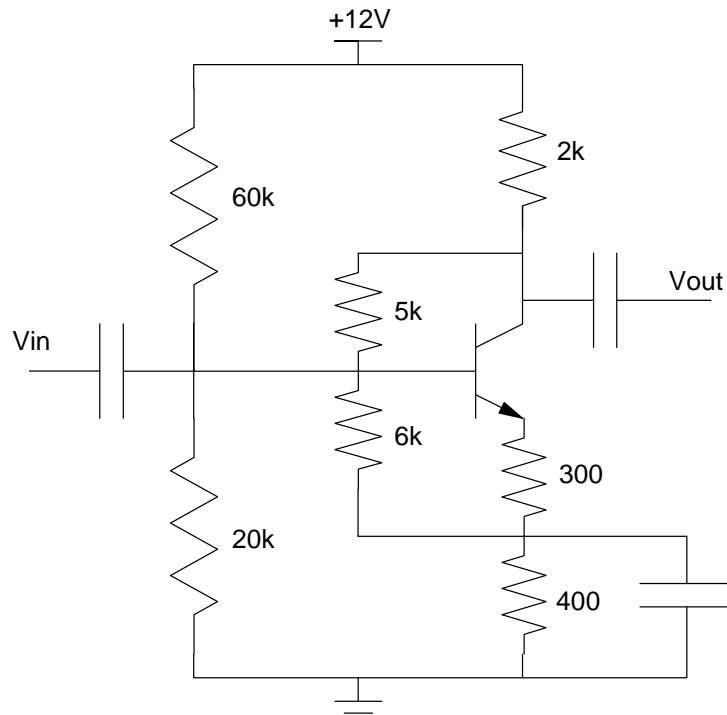
Assume $\beta = 100$

| R1 | R2 | Vb | Rb |
|----|----|----|----|
| | | | |



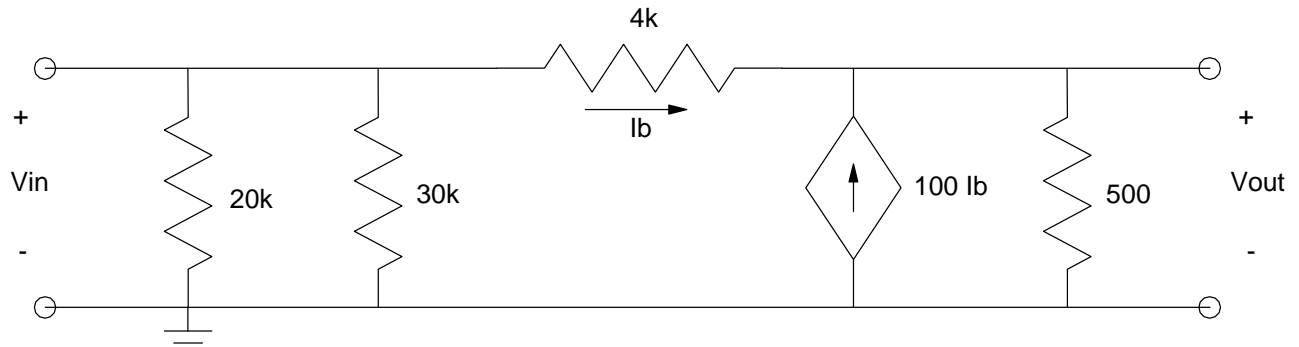
6) Draw the small-signal model for the following amplifier. Assume

- $\beta = 100$
- $r_f = 1500\Omega$



7) Determine the 2-port model for the following amplifier

| R_{in} | A_i | R_{out} | A_o |
|----------|-------|-----------|-------|
| | | | |



Bonus! If the electoral college refuses to elect either Trump or Clinton, who determines who is our next President?