Constraints [1]

* Collector-Base Voltage = 60 v
* Collector-Emitter Voltage = 30 v
* Base-Emitter Voltage = 5 v
* Power dissipation = 500 mW
* Temperature 125 C

Equations

1. From design spec, decide what Ic(max) should be
2. Find operating point from DC load line, transistor characteristics
   1. DC load line co-ords: (x1,y1) = (Vcc, 0); (x2,y2) = (0, Ic(max))
   2. Line Eq: Ic = -Vce \* (Ic(max)/Vcc) + Ic (max)
   3. Decide operating point Vce. Find Iq = Ic. Or determine Iq, find Vce.
      1. Transistor will be biased with R1, R2 to be in operating point when no signal is applied. Keeping high Iq will increase idle power consumption. But as we will see later, low Iq would mean low Ic(max) to begin with, which will make Rc large => High output impedence, which is also bad. So find a good compromise.
3. Eq(1): Ic(max) = (Vcc - Vce) / (Rc + Re)
4. Determine Rc+Re
   1. Ic(max) = Ic when Vce = 0
   2. I.e., Ic (max) = Vcc/(Rc+Re)
   3. Eq (2): Rc + Re = Vcc/Ic(max)
5. Eq (3): AC gain = -Rc/Re [2]
6. Eq(2) + Eq(3) will get us Rc, Re values
7. Eq(4): R1/(R1+R2) = (Vbe+Ve)/Vcc = {(0.6V or 0.7V) + IeRe}/Vcc
   1. Use Ie ~= Ic. Biasing is all about operating point. So use Ic at operating point
8. Bias stability requires current through R1, R2 be ten times Ib [3]
   1. R1 + R2 = Vcc/(10\*Ib) = Vcc/(10\*Ic/hFE). Use Ic at operating point. hFE is open loop curent gain. This is required for bias stability [4][5]
   2. Note: hFE is not a precise value. It keeps changing with a lot of things.

Talk more about Emitter follower Vs. Common Collector

References:

[1] <http://hyperphysics.phy-astr.gsu.edu/hbase/Solids/trans.html#c5>

[2] <http://www.colorado.edu/physics/phys3330/PDF/Experiment7.pdf>

[3] <http://hyperphysics.phy-astr.gsu.edu/hbase/Electronic/npncebias.html#c1>

[4] <http://www.learnabout-electronics.org/Amplifiers/amplifiers21.php>

[5] <http://www.learnabout-electronics.org/Amplifiers/amplifiers12.php#stabilisation>

[6] <http://www.eng.uokufa.edu.iq/staff/adnansabbar/lectures/lecture%2006.pdf>

[7] <http://www.eng.uokufa.edu.iq/staff/adnansabbar/lectures/lecture%2007.pdf>