3EJ4 Lab 1 Report

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**Question 1:**

Note: I am using Excel build in **slope() and intercept()** function instead of reading the formula in the plot Ic vs Vce. VA value will be more exact.

Choosing when VE= -1.5V and VCC=0.5V.

1. VBEon= 0.621V, IB=8.79uA
2. = 117
3. |VA| = 933V
4. r0 = 911kohm
5. gm = 41mS
6. r = 2.845kohm

**Question 2:**

Choosing when VE= -1V and VCC=0.5V.

1. Ic = 0.87mA
2. VBEon = 0.6564V, IB =3.44uA
3. = 253
4. |VA|=79V
5. r0 = 90.4kohm
6. gm = 34.8mS
7. r =7.276kohm

**Question 3:**

Choosing when VE= 1.5V and VCC=-0.5V.

1. VBEon=0.66V, IB=8.40uA
2. =123
3. |VA|=138V
4. r0 =134kohm
5. gm=41.2mS
6. r =2.976kohm

**Question 4:**

Choosing when VE= 1V and VCC=-0.5V.

1. Ic =1.13mA
2. VBEon=0.636V, IB=3.64uA
3. =309
4. |VA|=39V
5. r0 =34.6kohm
6. gm=45mS
7. r=6.868kohm

**Question 5:**

In loop:

**Question 6:**

Since there is no VBB in prelab 1.3, the formula is:

If there is VBB in 1.3, the formula will be

The difference is the term in the denominator. Since this term will always larger than 0, it increases the value in denominator.

In terms of in Q5 :

In 1.3 is:

Since the denominator is larger in Q5, the same value in will result a smaller change in IB.

**Question 7:**

图示

描述已自动生成

Figure above is the pi-model to find output resistance:

In the loop:

Ratio between current is inverse proportional to the corresponding resistance value. Note that Irpi flows to different direction from Io, it requires a negative sign in the ratio.

Solve for Ro:

Rearrange the equation:

**Question 8:**

Vo min originally is (VEE +0.3). Inserting R3 will result in:

**Question 9:**

In Q1 the value of beta is 117.

Calculate R1:

Solve this equation using R2=100kohm

图表, 折线图

描述已自动生成The Behavior in partsim is close to the expected behavior. The current at C(green line) is approximately 1mA when Vcc is larger than -1V.

**Question 10:**

In the same graph as question 9, we can see when current is in active region, Vcc is close to -1V, and Ve is -1.311V. Therefore, the |Vce| should approximately larger or equal to 0.311V to be in the active region.

