

ECEN 325 – Electronics

Fall 2020

Lab 7: Report



Submitted by:

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I. Objective

The objective of this lab is to understand the characterization and DC Biasing of BJTs by building and analyzing NPN and PNP bipolar junction transistor circuits.

II. Procedure

For the procedure I first had to calculate the values of unknown resistors for two NPN BJT circuits and two PNP BJT circuits. Then I created a schematic of the four circuits and built a breadboard design for each of them. After that, I created schematics for two BJT other circuits and performed a DC sweep of both of them to create plots and then took measurements of the circuits I had calculated the unknown resistors for.

III. Difficulties

There were no difficulties during the lab.

IV. Results

Fig.2 Circuit schematic

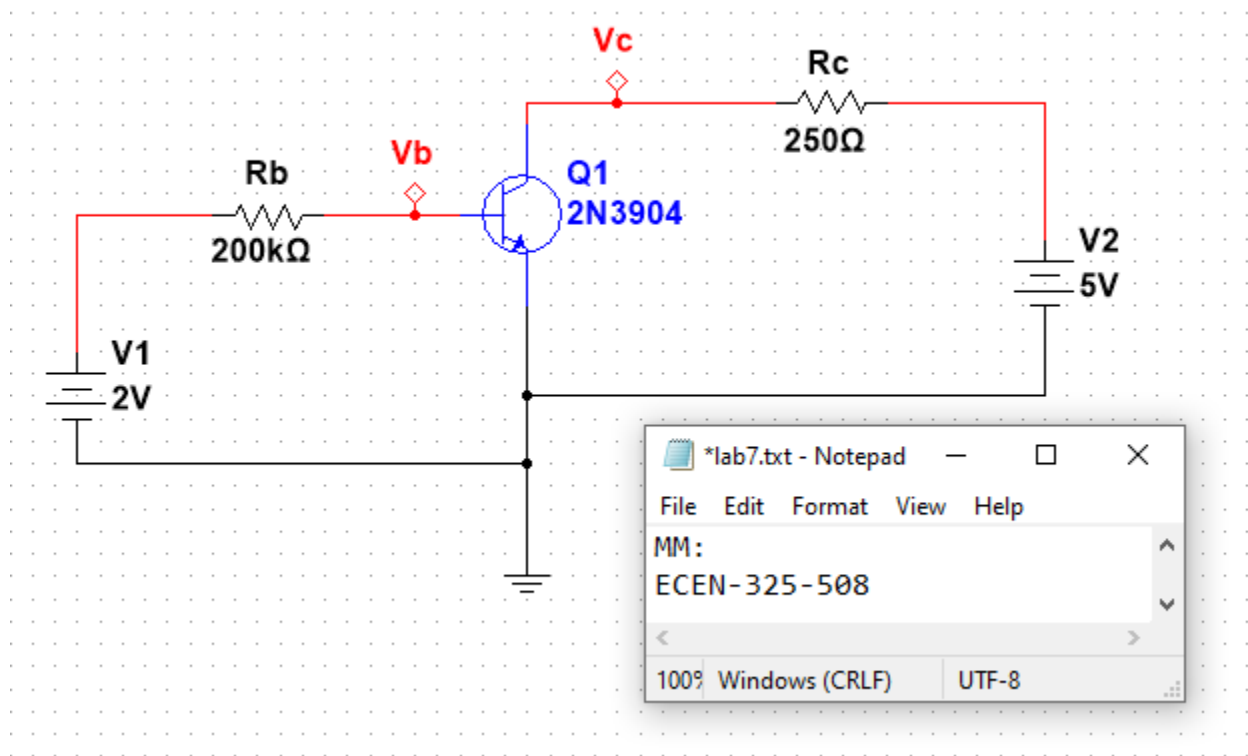


Fig.4 Circuit schematic

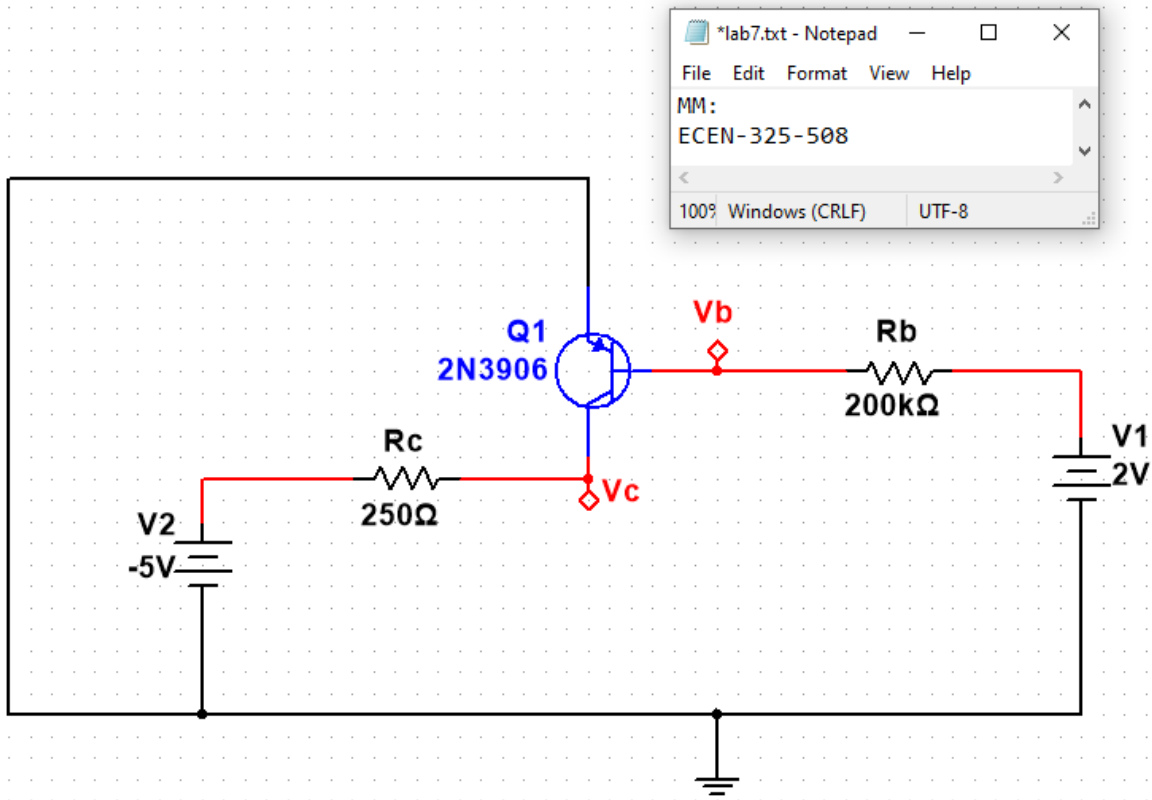


Fig.6a Circuit schematic

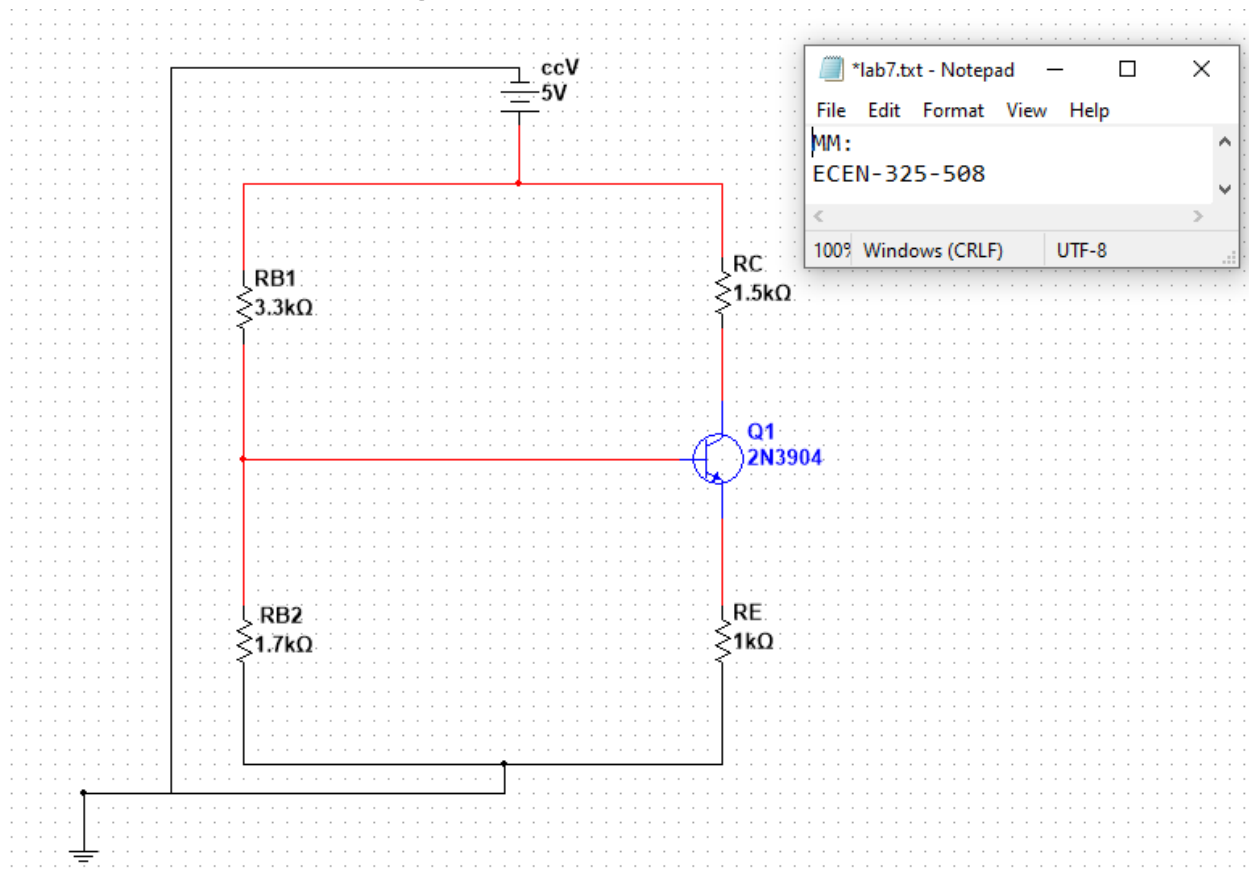


Fig.6b Circuit schematic

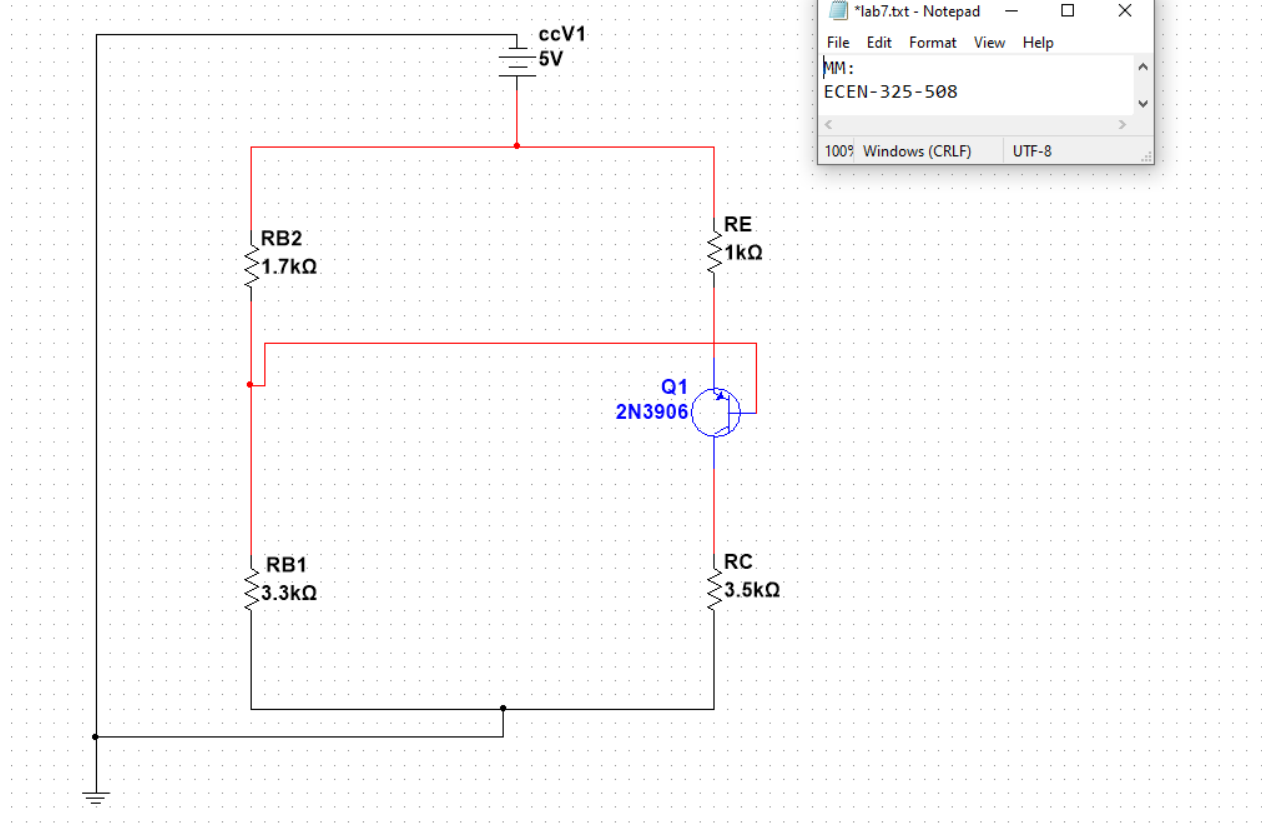


Fig.7b Circuit schematic

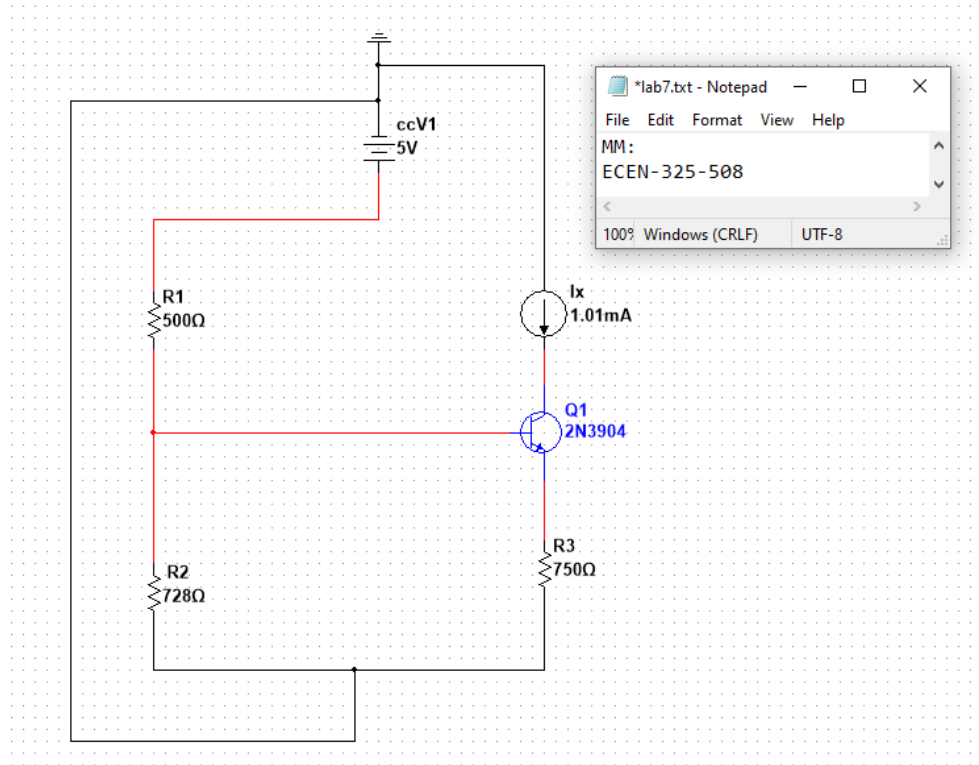


Fig.8b Circuit schematic

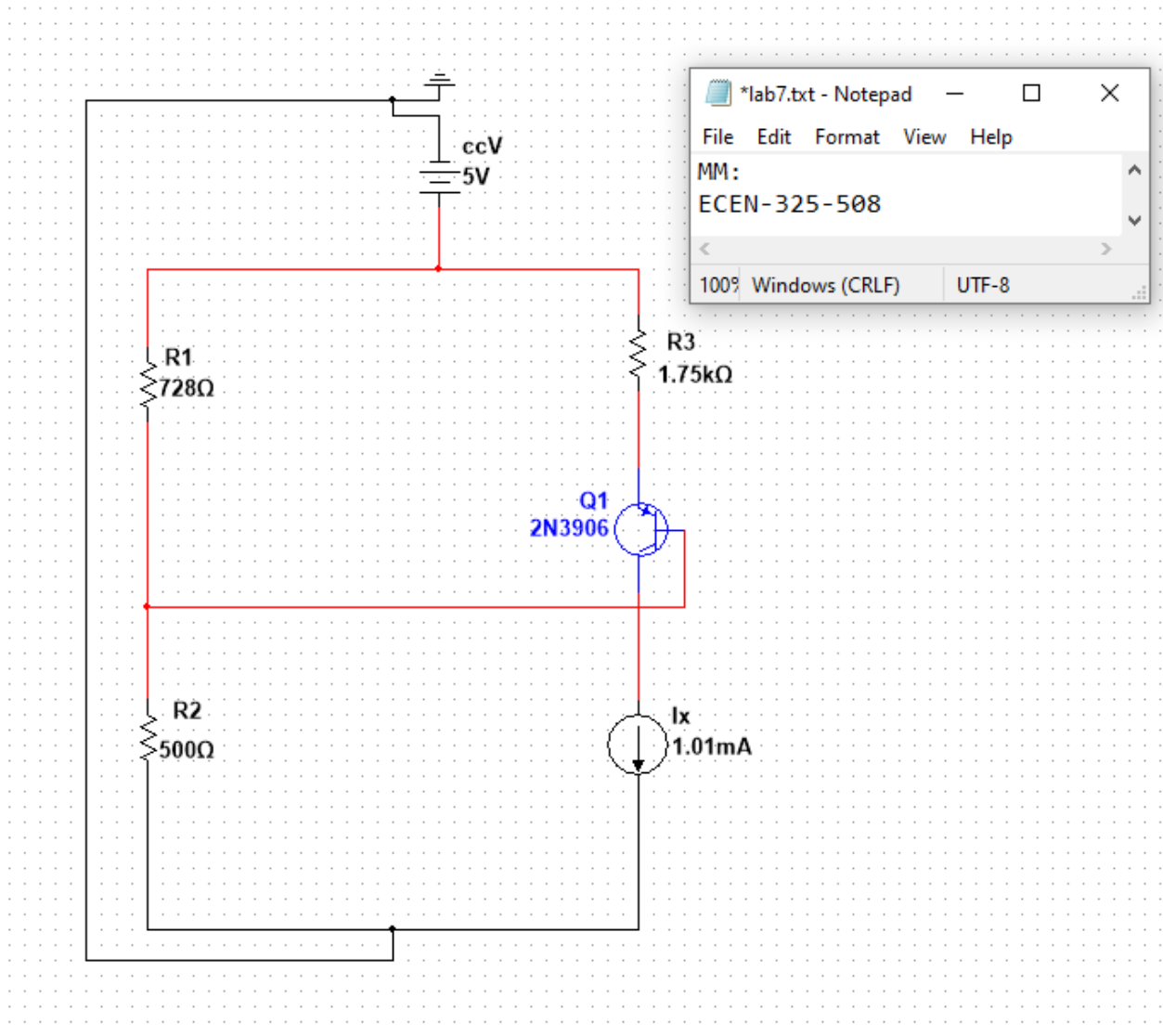


Fig.2 circuit I_C vs. V_{BE} measurements and plot

V_{BE} (V)	I_C (mA)
1.35849E-06	1.21374E-08
0.399695974	3.6815E-05
0.603751271	0.097773746
0.636062759	0.339212388
0.651820713	0.620222134
0.66222175	0.921613199
0.669962519	1.235388828
0.676125314	1.557791623
0.68125872	1.887499079
0.685621136	2.219751647
0.689430283	2.55514564
0.6928111	2.892839646
0.695849012	3.231993929

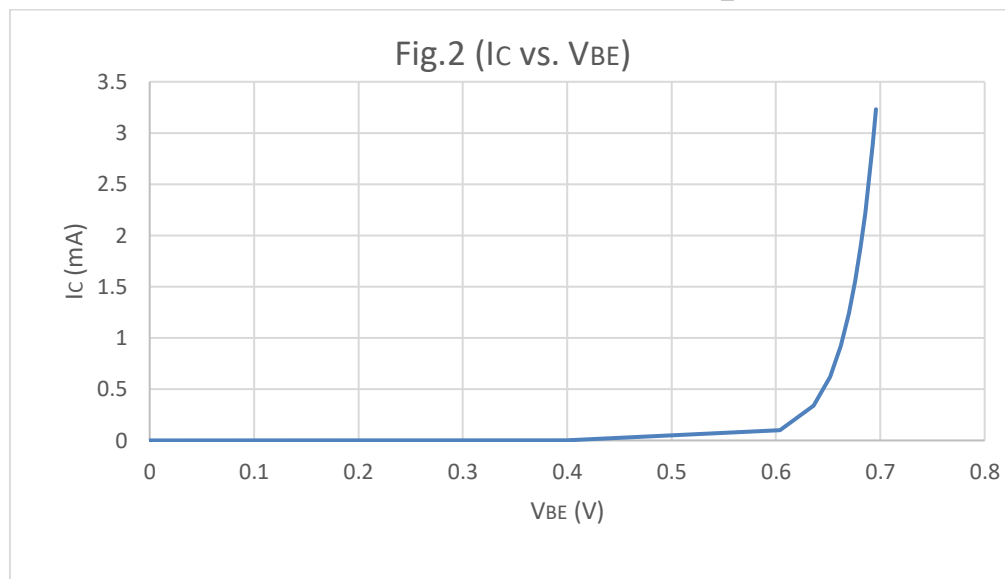


Fig.2 circuit I_C vs. V_{CE} measurements and plot

V_{CE} (V)	I_C (mA)
0.00171957	-0.00687828
0.20077632	0.796964208
0.581979094	0.872294016
0.9807966	0.876817478
1.379620596	0.881517629
1.778444714	0.886221138
2.177268833	0.890924663
2.576092951	0.89562819
2.974917069	0.900331717
3.373741187	0.905035245
3.772565304	0.909738775
4.171389421	9.14E-01
4.570213538	0.919145835

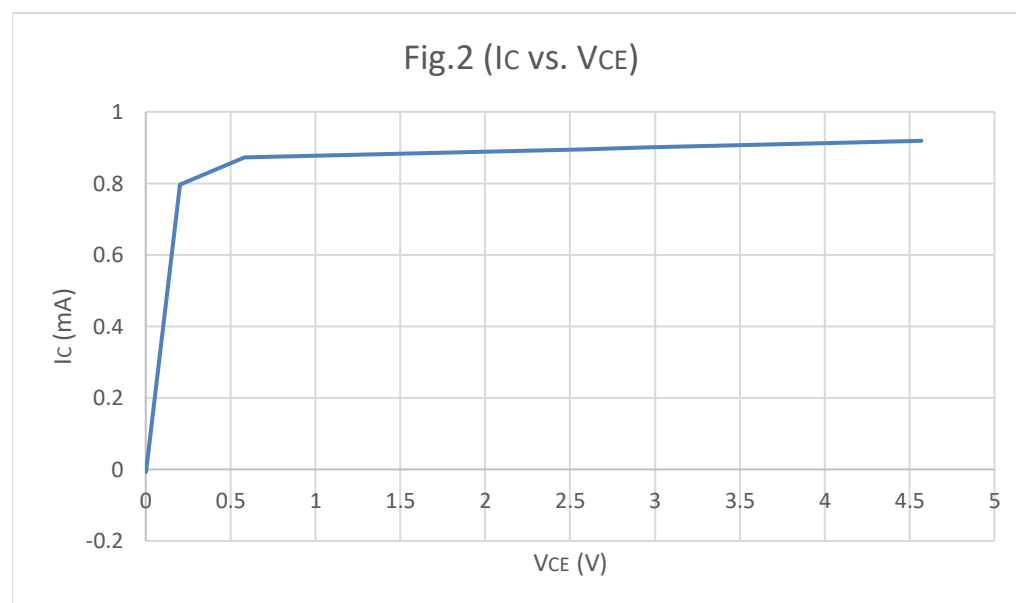


Fig.4 circuit I_C vs. V_{EB} measurements and plot

V_{EB} (V)	I_C (mA)
-0.740834593	4.303180604
-0.73760285	3.934256289
-0.733922362	3.559627093
-0.729643081	3.178994659
-0.724535007	2.792380842
-0.718171826	2.399771907
-0.709797326	2.001263372
-0.697493606	1.597204068
-0.67415641	1.185639434
-0.499617786	0.771834621
-2.00981E-07	0.359753914

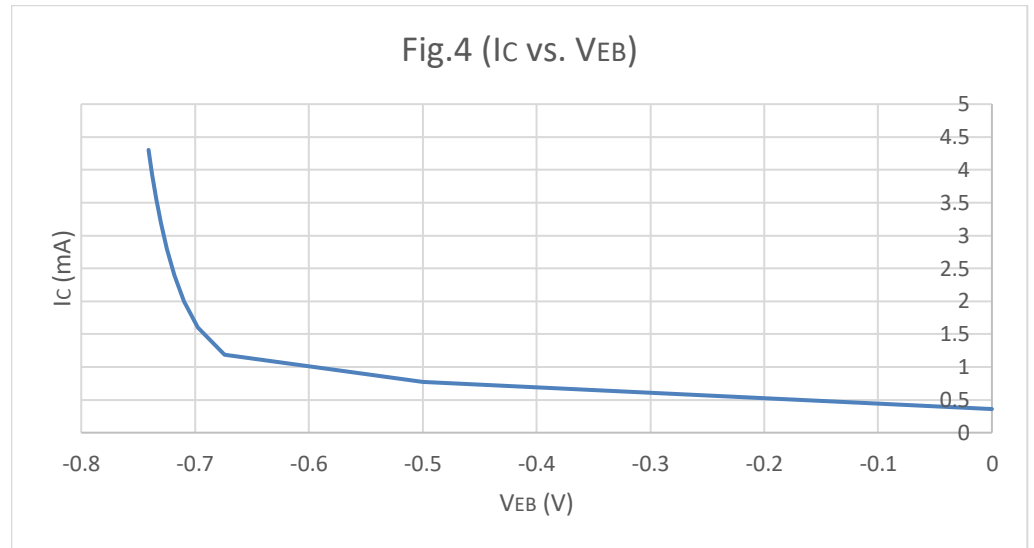


Fig.4 circuit I_C vs. V_{EC} measurements and plot

V_{EC} (V)	I_C (mA)
-4.652186038	1.391255835
-4.159750418	1.360998319
-3.667314797	1.330740803
-3.174879176	1.300483289
-2.682443555	1.270225775
-2.190007933	1.239968262
-1.697572311	1.209710751
-1.205136689	1.17945324
-0.712701067	1.14919573
-0.222299976	1.110826157
-0.001267793	-0.005072227

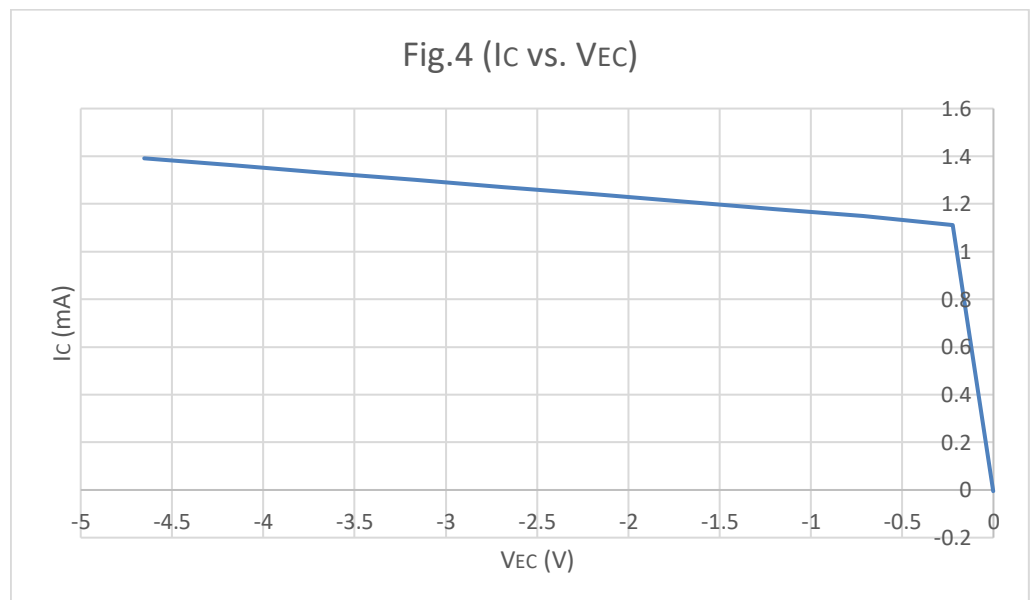


Fig.6a circuit measured and calculated results

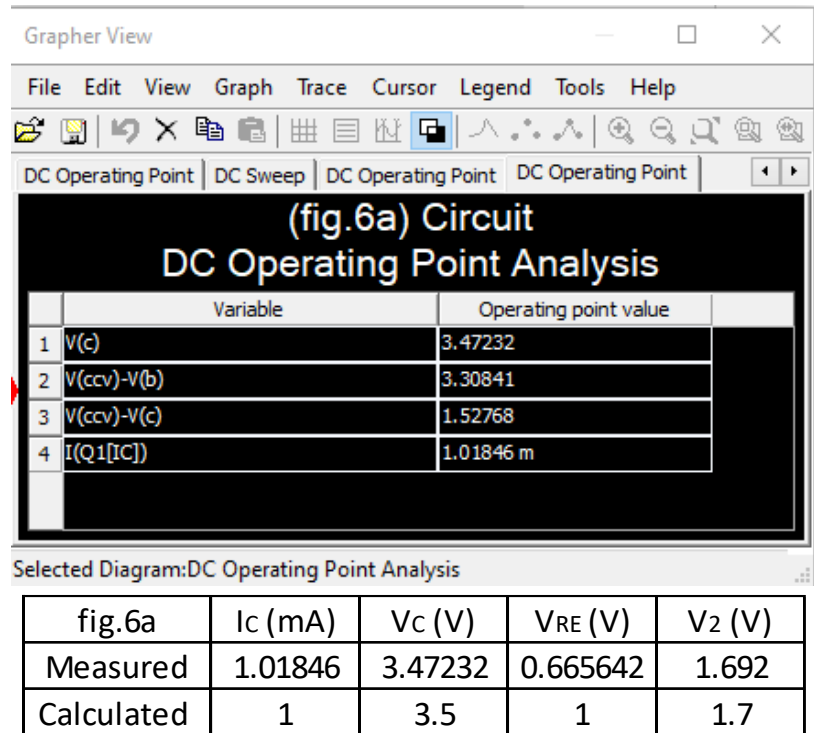


Fig.6a circuit measured and calculated results

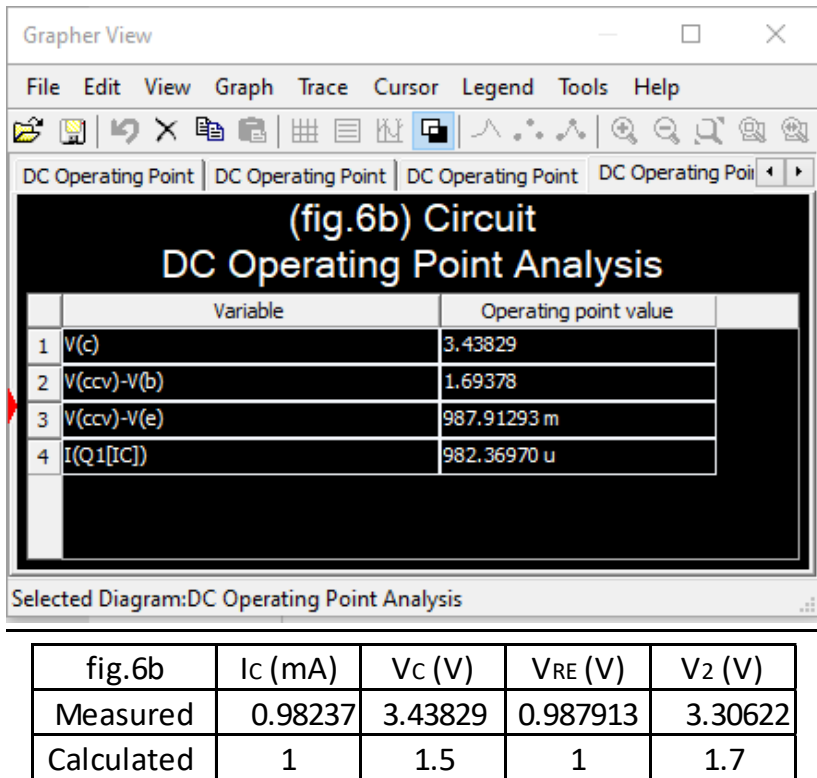


Fig.7b circuit measured and calculated results

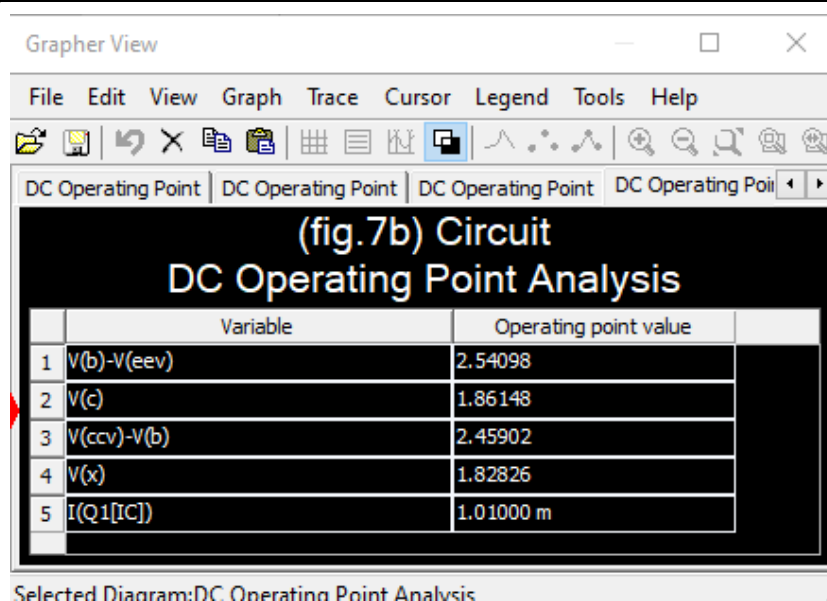


fig.7b	Ic (mA)	Vc (V)	V2 (V)	Vx (V)	Vy (V)
Measured	1.01	1.86148	2.45902	1.86148	2.54098
Calculated	2	3.5	2.2	1.5	2.2

Fig.8b circuit measured and calculated results

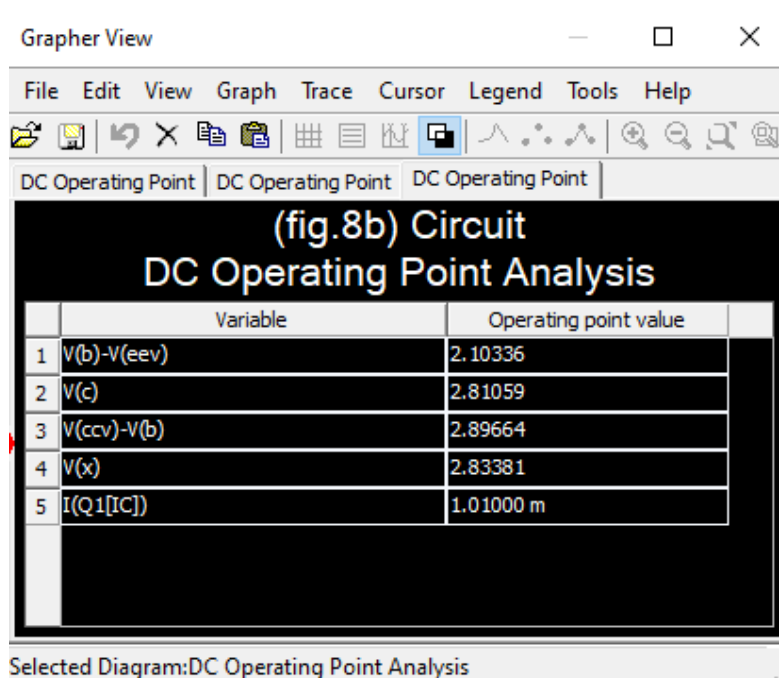


fig.8b	Ic (mA)	Vc (V)	V2 (V)	Vx (V)	Vy (V)
Measured	1.01	2.81059	2.83381	2.83381	2.1
Calculated	2	1.5	2.2	1.5	2.2

V. Conclusion

In conclusion, when comparing my calculated with my measured results there was only a slight difference for fig.6a. which might have been due to the tolerance of the BTS. For fig.6b the only big difference from my calculated and my measured results was V_c , and this is most likely due to changing the resistor value for R_c instead of using its original value from fig.6a. For fig.7b and fig.8b the differences between my measured and calculated results might be due to trying to solve the unknown resistors of fig.7a and fig.8a and putting resistors and current sources in the wrong position.