North South University

Department of Electrical & Computer Engineering

LAB REPORT

Spring 2021

Course Code : EEE 111

Course Title: Analog Electronics - I

Section: 7

Experiment Number: 05

Experiment Name:

The Input-Output characteristics of CE (common emitter) configuration of BJT.

Experiment Date: 13 / 04 / 2021

Date of Submission: 27 / 04 / 2021

Course Instructor: Syeda Sarita Hassan

Submitted To: Fatema Zahra

Name of experiment:

The input-Output characteristics of CE (common emitter) configuration of BJT.

Objective:

Study of the input-output characteristics of CE (common emitter) configuration of BJT.

Equipments and components:

1) Transistor — C828 — 1 piece.
2) Resistors — 100KΩ, 1kΩ — 1piece each
3) Trainer Board —— 1unit.
4) DC power supply —— 1unit.
5) Digital Multimeter —— 1unit
6) Chords and wire —— 1unit.

R.T.O)

Theory: There are three doped regions in a transistor.

i) Emitter

ii) Base

iii) Collector

Emitters will emit electrons or holes. And collectors will collelec electors or holes. Base is the middle zone between the emitter and collector. The characteristics of a transistor is measured by two characteristics.

i) Input-Characteristics:

Input current vs Input voltage where the value of output voltage is fixed.

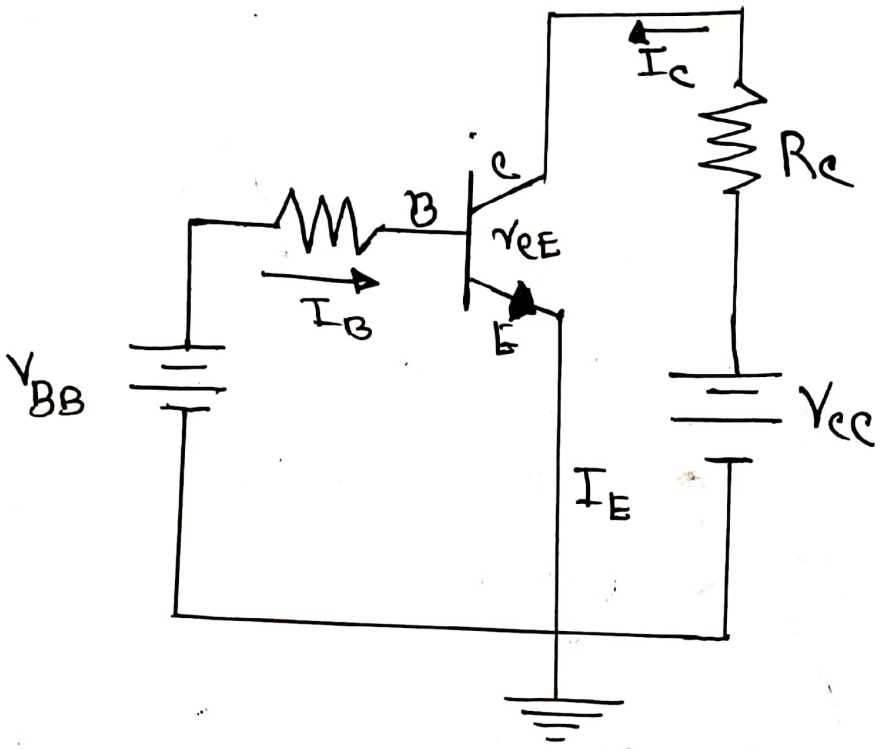
ii) Output - Characteristics:

Output current vs Output voltage where the value of input current is fixed.

Circuit Diagram:

$R_B = 100K$

$R_c = 1K$



Tables:

table 1: Input Characteristics of BJT

V_{CE} = 1V			V_{CE} = 5V		
V_{BB} volts	V_{BE} volts	$I_B = V_{RB}/R_B$ mA	V_{BB} volts	V_{BE} volts	$I_B = V_{RB}/R_B$ mA
0.1	0.1V	0 μA	0.1	0.1V	0 μA
0.3	0.3V	0.0006μA	0.3	0.3V	0.0006μA
0.5	0.4V	0.128μA	0.5	0.4V	0.128μA
0.7	0.560V	1.328μA	0.7	0.567V	1.328μA
1.0	0.600V	3.961 μA	1.0	0.603V	3.961μA
2.0	0.630V	13.690μA	2.0	0.644V	13.690μA
3.0	0.632V	23.670μA	3.0	0.662V	23.670μA
4.0	0.633V	33.664μA	4.0	0.674V	33.667μA
5.0	0.634V	43.556μA	5.0	0.681V	43.516μA
7.0	0.635V	63.643μA	7.0	0.682V	63.643μA
9.0	0.636V	83.484μA	9.0	0.682V	83.484μA
10.0	0.637V	93.626μA	10.0	0.682V	93.626μA
12.0	0.638V	113.613μA	12.0	0.683V	11.3.613μA
14.0	0.639V	133.606μA	14.0	0.683V	133.607μA
16.0	0.640V	153.593μA	16.0	0.683V	153.593μA

table 2: Output Characteristics of BJT

	$I_B = 20\mu A$		$I_B = 30\mu A$		
V_{CC} volts	V_{CE} volts	$I_C = \frac{V_{RC}}{R_C}$ mA	V_{CC} volts	V_{CE} volts	$I_C = \frac{V_{RC}}{R_C}$ mA
1.0	0.0118V	0.881mA	1.0	0.99V	0.99mA
2.0	0.185V	1.81mA	2.0	0.136V	1.86mA
3.0	0.783V	2.21mA	3.0	0.183V	2.81mA
4.0	1.603V	2.39mA	4.0	0.584V	3.41mA
5.0	2.420V	2.57mA	5.0	1.33V	3.67mA
6.0	3.240V	3.11mA	6.0	2.06V	3.96mA
8.0	4.880V	3.47mA	8.0	3.55V	4.44mA
10.0	6.520V	3.88mA	10.0	5.03V	4.96mA
12.0	8.150V	4.00mA	12.0	6.52V	5.47mA
14.0	9.790V	4.20mA	14.0	8.00V	5.99mA
16.0	11.430V	4.56mA	16.0	9.49V	6.50mA
18.0	13.070V	4.92mA	18.0	10.97V	7.02mA
20.0	14.011V	5.28mA	20.0	12.46V	7.53mA
22.0	16.350V	5.64mA	22.0	13.95V	8.04mA
24.0	17.990V	6.00mA	24.0	15.45V	8.56mA

Question & Answer:

① Ans:

I_B vs V_{BE} graph has been attached

② Ans:

I_C vs V_{CE} graph has been attached

③ Ans:

For $I_B = 20\mu A$

$$\beta = \frac{I_C}{I_B} = \frac{4.2mA}{20\mu A}$$

$$= 210$$

For $I_B = 30\mu A$

$$\beta = \frac{I_C}{I_B} = \frac{5.99mA}{30\mu A}$$

$$\Rightarrow 199.66 \approx 200$$

④Ans:

For table 01:

When $V_{CE} = 1V$

The Qpoint is (0.63v, 113.61μA) For 12v.

when $V_{CE} = 5V$

The Q point is (0.68v, 113.61μA) for 12v.

For table 02:

When, $I_B = 20\mu A$

The Q point is (8.15v, 4.00mA) for 12v.

when, $I_B = 30\mu A$

The Q point is (6.52, 5.47mA) for 12v.

Discussion:

In this experiment we have learned about the input and output characteristics of a transistor. How the different regions work. The circuit was easy to do in multisim but because of so many values the graphs were quite difficult.

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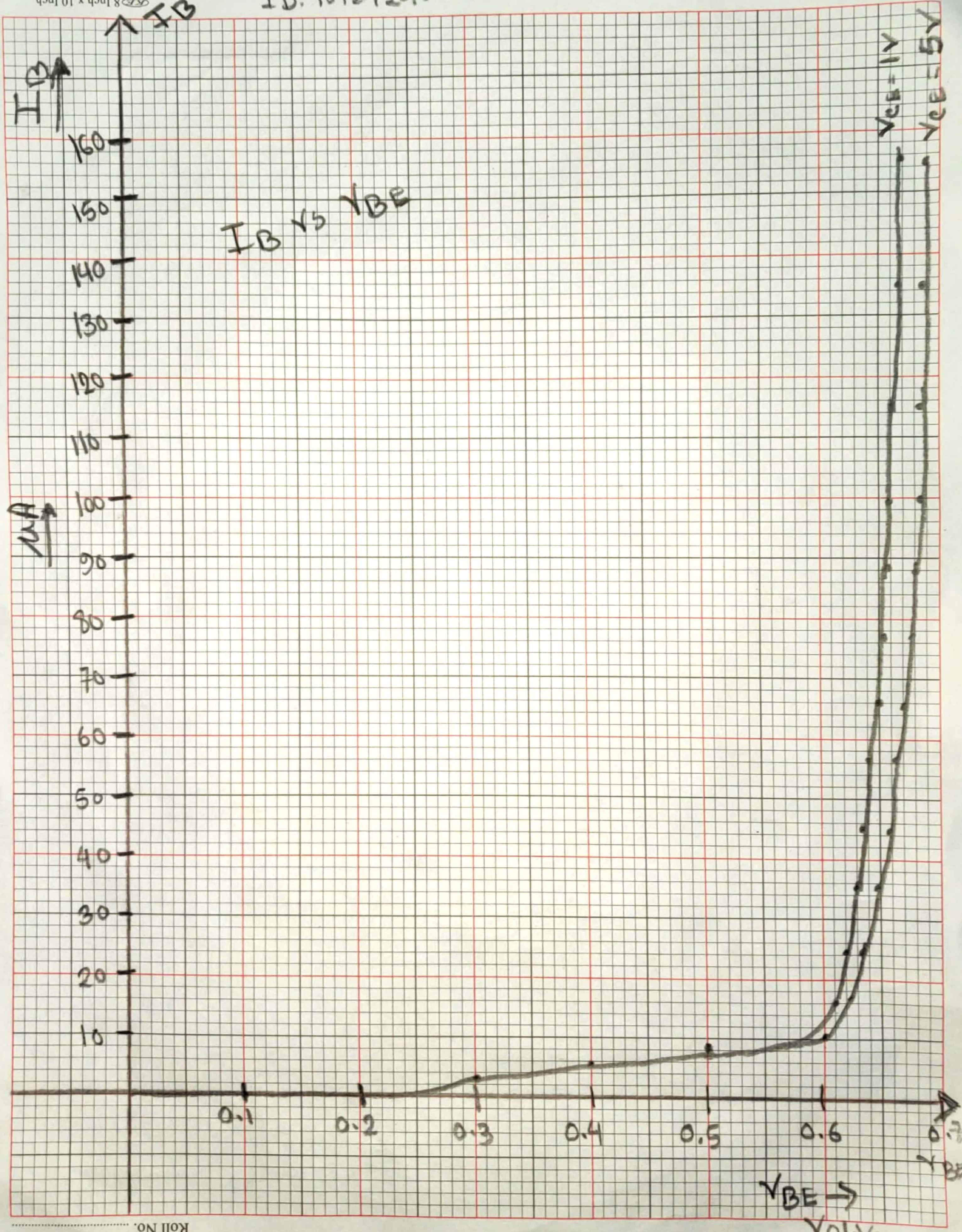

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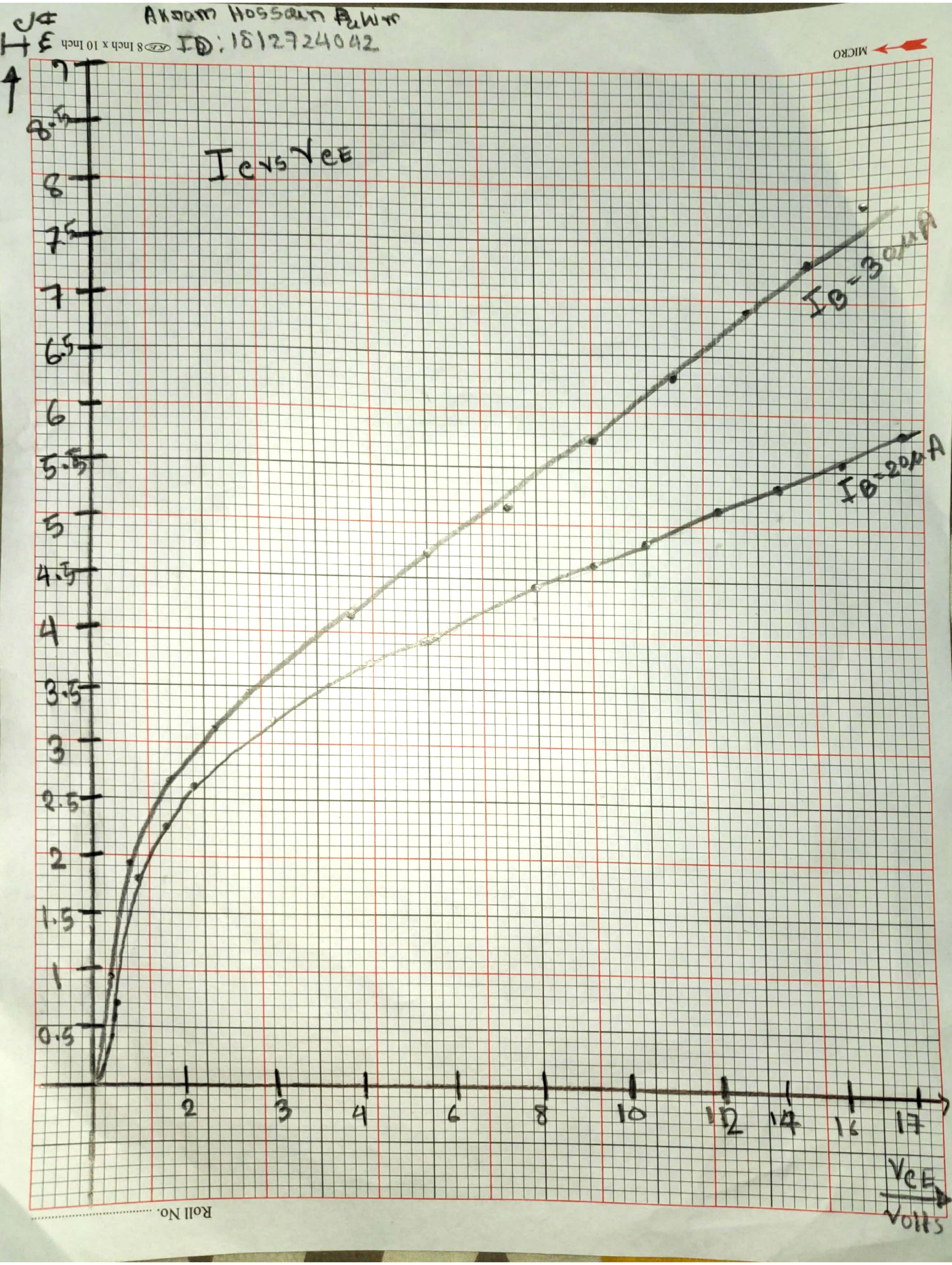

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