HOLY ANGEL UNIVERSITY
College of Engineering and Architecture
DEPARTMENT OF ELECTRONICS ENGINEERING

EXPERIMENT # 7
EXPERIMENT TITLE: Current Gains on Transistors & Characteristics of common emitter & common collector

COURSE CODE: 4760
COURSE: ELECTRONIC DEVICES AND CIRCUIT THEORY LABORATORY

SCHEDULE (Day/Time/Room): M 1:20 - 4:20 PM ECE Laboratory

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GROUP No.: 6

DATE PERFORMED: 03/24/24
DUE DATE: 04/08/24

DATE SUBMITTED: 04/08/24

INSTRUCTOR: Engr. Cherry Navarro

SCORE SHEET

CRITERIA	SCORE
Participation (20%) [Ability to perform task in collaboration with teammates; well prepared in class; and time management skills] 1-4 Superficial 9-12 Satisfactory 17-20 Excellent 5-8 Ordinary 13-16 Very Good	
Data and Results (40%)	
Answers to Questions (15%)	
Discussion of Findings (25%) [Ability to highlight the implications of the experimental results with respect to the theoretical foundations; Analytical skill; Communication skills] 1-5 Unsatisfactory 11-15 Satisfactory 21-25 Excellent 6-10 Deficient 16-20 Very Good	
TOTAL	

INSTRUCTOR'S SIGNATURE: ____________

EXPERIMENT 7

DATAANDRESULTS

Part1

Table7-1.TestDataforMeasuringAlpha

STEP	I_E,mA	I_C,mA		Effectsin $I_C$ofincreasingI_E
2	Minimum	0.05		I_C increases along with I_E
2	Maximum	0.08		
Step	I_E,mA	I_B,µA	I_C,mA	CollectorVoltage
4	2	20	1.99mA	4
4	2.4	24	2.38 mA	4
4	$\alpha=I_C/I_E=$ 0.99			

Table7-2.TestDataforMeasuringBeta

Step	I_B,µA	I_C,mA	Effectsin $I_C$ofincreasingI_B
8	10	1	Increasing I_B increases I_C
9	Maximum	4.91	
Step	I_B,µA	I_C,ma	CollectorVoltage
10	25	2.5	4
11	30	3.01	4
12	$\beta=I_C/I_B=$ 100		

Part2

Table7-3.Inputcharacteristicsof thecommonemitterconfiguration

V_{CE}=3V			V_{CE}=5V		
V_{BE}	V_{RB}(mV)	$I_B=V_{RB}/R_B$(µA)	V_{BE}	V_{RB}(mV)	$I_B=V_{RB}/R_B$(µA)
0.63V	50	50	0.63V	39	39
0.64V	70	70	0.64V	60	60
0.65V	80	80	0.65V	89	89
0.66V	100	100	0.66V	112	110

BASIC ELECTRONICS

Table7-4.OutputCharacteristicsof theCommonEmitter

V_{CE}	I_B=10µA		I_B=20µA		I_B=30µA		I_B=40µA		I_B=50µA	
	V_{RC} (mV)	$I_C=V_{RC}$ (mA)R_C	V_{RC} (mV)	$I_C=V_{RC}$ (mA)R_C	V_{RC} (mV)	$I_C=V_{RC}$ (mA)R_C	V_{RC} (mV)	$IC=V_{RC}$ (mA)R_C	V_{RC} (mV)	$I_C=V_{RC}$ (mA)R_C
0.2V	98.41	0.9839	196.860	1.96	201.90	2.07	388.01	3.88	459.98	4.59
0.4V	101.507	1.013	204.349	2.04	300.10	3.00	400.17	4.00	476.10	4.76
0.8V	101.509	1.015	204.359	2.04	300.10	3.00	400.18	4.00	480.87	4.80
1.0V	101.519	1.0131	204.359	2.04	300.10	3.00	400.18	4.00	480.87	4.80
3.0V	101.510	1.01510	204.359	2.04	300.10	3.00	400.18	4.00	480.87	4.80
5.0V	101.510	1.01510	204.359	2.04	300.10	3.00	400.18	4.00	480.87	4.80

Table7-5.InputCharacteristicsofCommonCollector

V_{CE}=3V			V_{CE}=5V			V_{CE}=7V		
V_{CB}	V_{RB}(mV)	$I_B=V_{RB}/R_B$ (µA)	V_{CB}	V_{RB} (mV)	$I_B=V_{RB}/R_B$ (µA)	V_{CB}	V_{RB} (mV)	$I_B=V_{RB}/R_B$ (µA)
2.4V	2.390	2.390	4.4V	4.396	4.396	6.4V	6.431	6.431
2.38V	2.375	2.375	4.38V	4.379	4.379	6.39V	6.388	6.388
2.36V	2.370	2.370	4.36V	4.355	4.355	6.38V	6.374	6.374
2.34V	2.335	2.335	4.34V	4.341	4.341	6.36V	6.358	6.358

STEP8

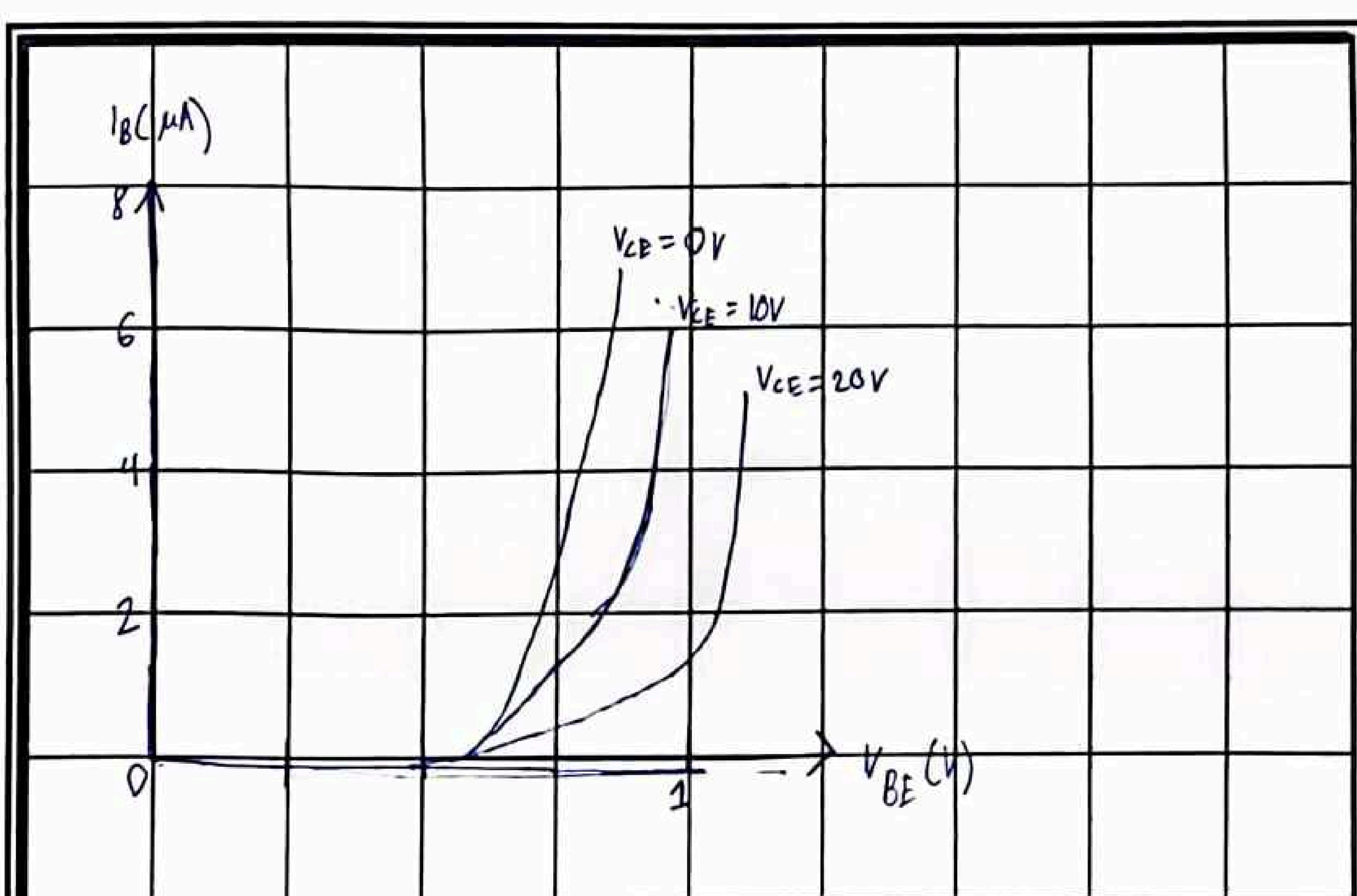

Figure7-5.InputCharacteristicof theCommonEmitterBiasCircuit

REVIEWQUESTIONS

1.DefineBeta

2.Describeindetailaprocedureforgettingbeta.

3.Whatis thesignificanceofgettingbeta?

AnswerstoReviewQuestions

1. Beta, also known as common emitter current gain or hFE, is a key parameter of bipolar junction transistors (BJT). It shows the ratio of the collector current (IC) to the base current (IB) in a BJT when emitter current is kept constant
2.
3.

DISCUSSIONOFFINDINGS:

In this experiment, we have to identify the current amplification factor alpha in order to observe the effects of varying the emitter current (IE) on the collector current (IC). Similarly, the experiment looks for alpha and investigates the effects of changing the base current (IB) on IC. In order to aid in circuit optimization and performance evaluation, the experiment also aims to create input and output characteristics for both biasing configurations. This will enable a thorough visualization of transistor behavior under various operating situations. The examination of current gain in common emitter and common collector configurations highlighted the amplification characteristics of the transistor, which are crucial for guaranteeing signal integrity and fidelity in practical applications. Lastly, this work contributes to our developing understanding of transistor behavior and offers insightful advice on building and refining transistor-based circuits for a wide range of electronic uses.

STEP9

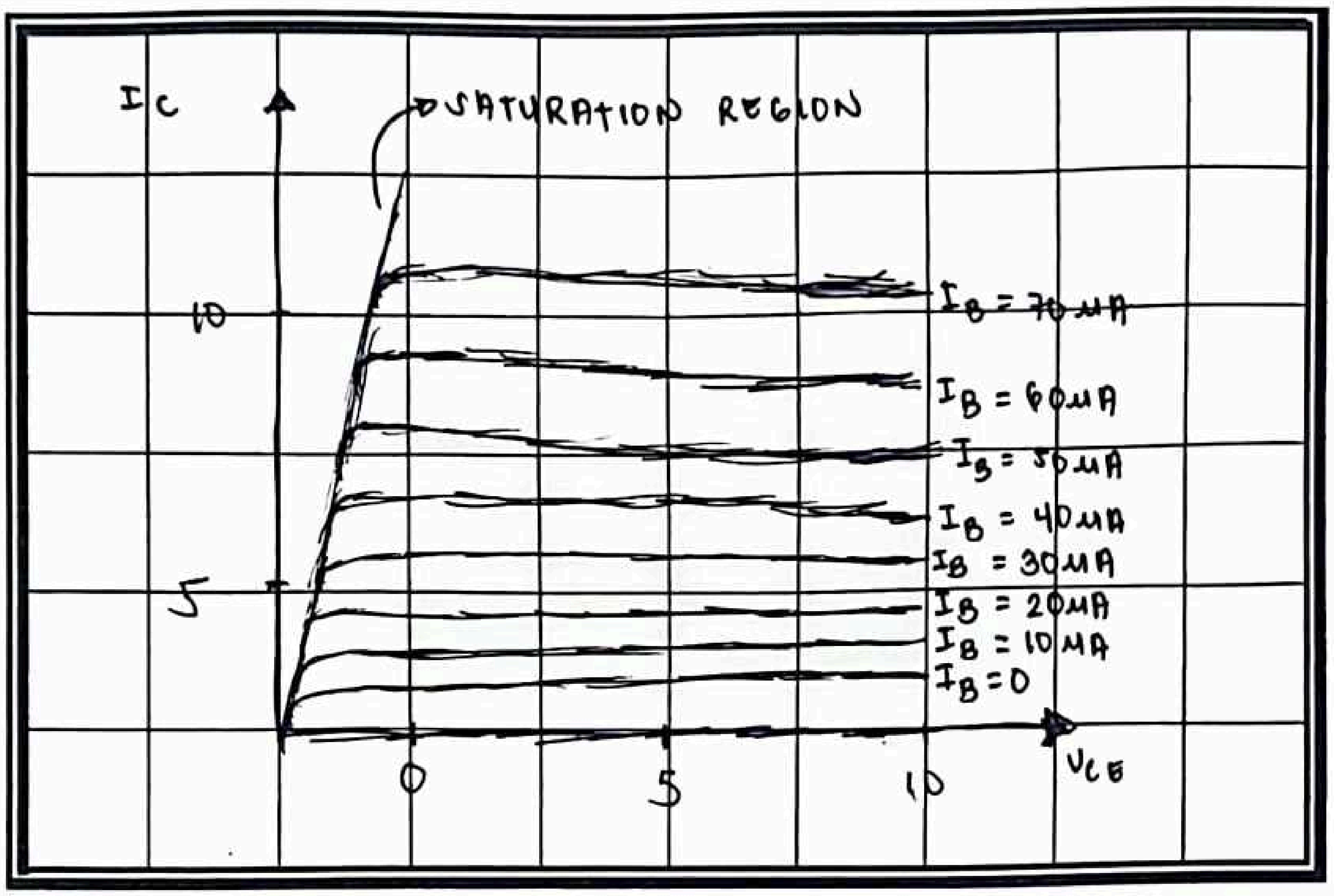

Figure7-6. OutputCharacteristicoftheCommonEmitterBiasCircuit

STEP10

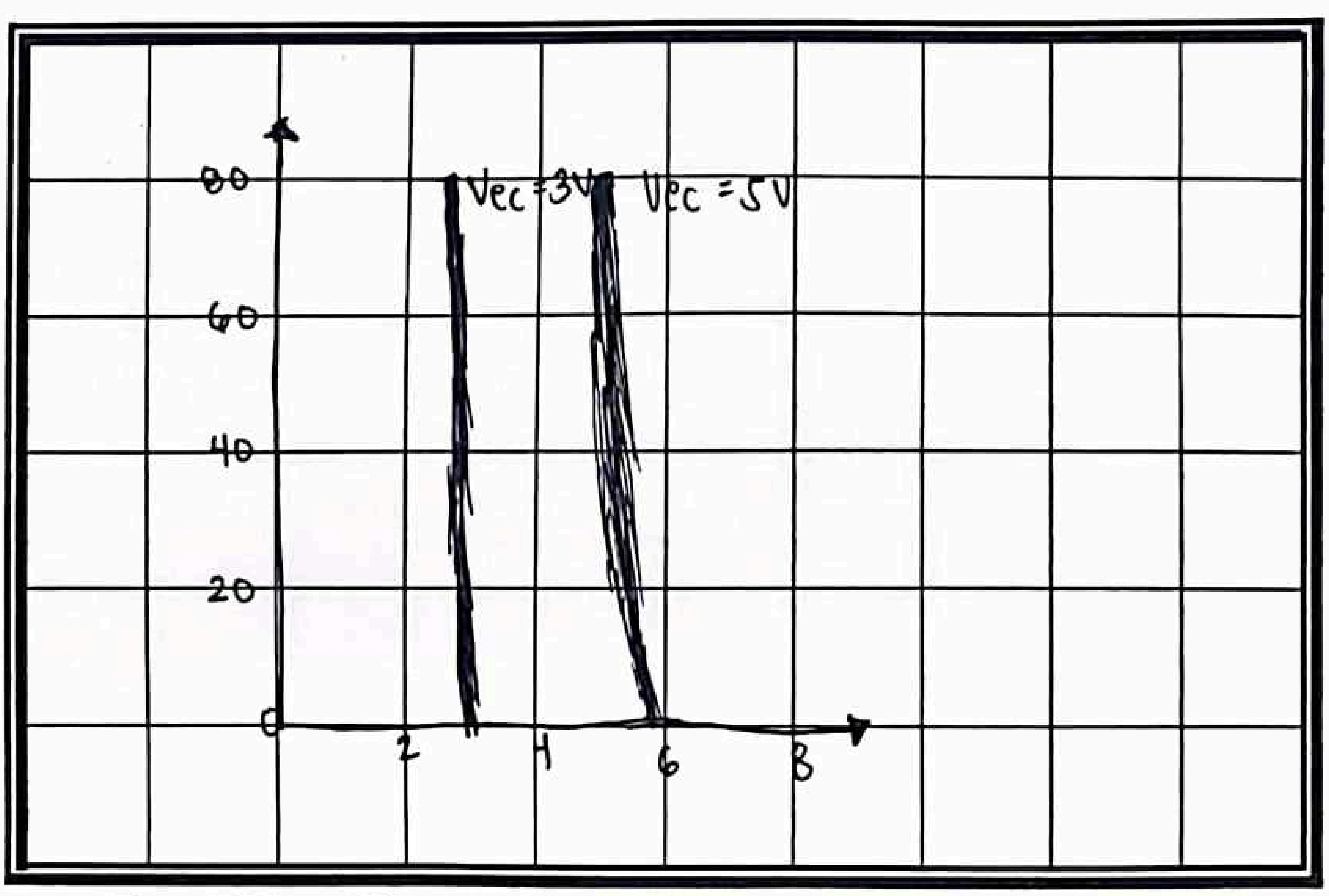

Figure7-7.InputCharacteristicof theCommonCollectorBiasCircuit

2. To determine the beta, the basic transistor circuit must first be set up with a BJT, suitable resistors and a power supply. Apply a small base current (IB) to the transistor while measuring the equivalent collector current (IC). Repeat this process for several different values of IB to establish the relationship between IB and IC. Plot these values with IC on the y-axis and IB on the x-axis. The slope of the resulting curve represents the beta value.

3. The importance of obtaining beta lies in its role as a crucial parameter in understanding and analyzing the behavior of bipolar junction transistors. Beta directly affects the gain characteristics of the transistor circuit and determines the magnitude of the output current (IC) relative to the input current (IB). Knowing the beta phase allows the engineer to design and optimize circuits for specific applications, ensuring the desired gain and efficiency. In addition, beta affects the stability and linearity of transistor circuits, affecting factors such as distortion and signal fidelity.