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Expt. No. 9

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AIM: TO STUDY INPUT/OUTPUT CHARACTERISTICS OF A NPN COMMON EMITTER TRANSISTOR.

REQUIREMENTS:

Transistor, Bread board, Resistors, Connecting wires, DC power supply, multimeters

THEORY:

The transistor is a two junction, three terminal semiconductor device which has three regions namely the emitter region, the base region, and the collector region. There are two types of transistors - npn and pnp.

An npn transistor has an n-type emitter, a p-type base and an n-type collector. A pnp transistor has a p-type emitter, an n-type base and a p-type collector.

The emitter is heavily doped, base region is thin and lightly doped, and collector is moderately doped and is the largest. The current conduction in transistors takes place due to both the charge carriers - that is electrones and holes, and hence, they are also called as Bipolar Junction Transistors.

For npn-transistor, input characteristics is the curve between input current I_B and input voltage V_{BE} for some constant collector emitter voltage V_{CE}. Similarly, output characteristics shows the relation between collector

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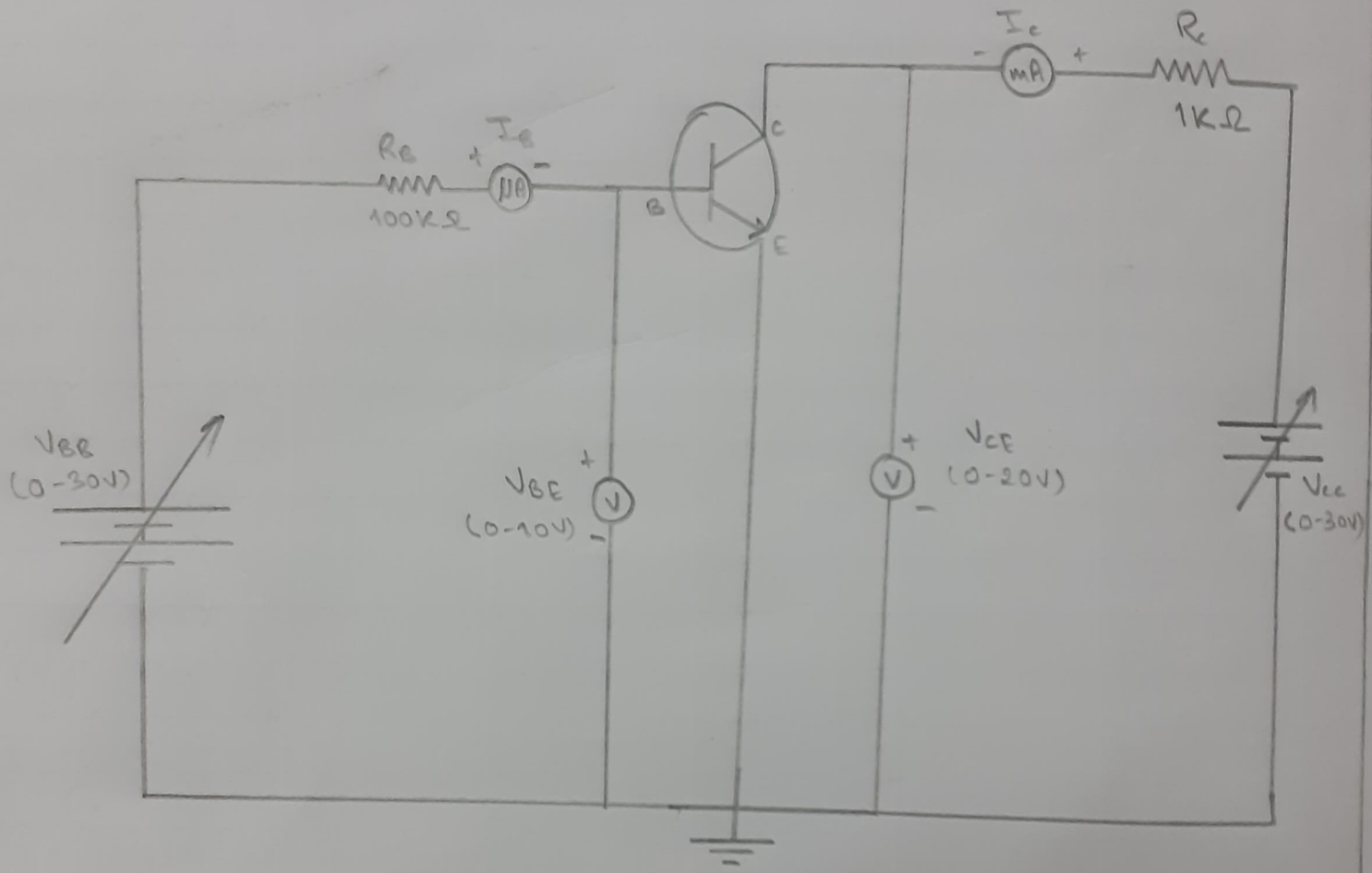

fig.: Circuit Diagram of npn - Transistor

current I_c and collector voltage V_{CE} for various constant values of I_B.

PROCEDURE:

i) The circuit was made as per the circuit diagram.
ii) For input characteristics; the forward bias voltage was applied on base junction.
iii) The base voltage voltage, V_{BE} and base current, I_B were read and noted.
iv) V_{BE} was kept on increasing until I_B value raised suddenly
v) The corresponding values of I_B for each value of V_B were noted.
vi) For output characteristics, the collector voltage, V_{CE} and the collector current, I_c were noted for every value variation in V_{cc}, while keeping I_B constant.
vii) The obtained values were noted and the graph was plotted accordingly.

OBSERVATION TABLE

INPUT CHARACTERISTICS

V_{BB} (in V)	V_{CE} = 2V		V_{CE} = 0V	
	V_{BE} (V)	I_B (μA)	V_{BE} (V)	I_B (μA)
2.8	0.15	0.14	0.14	0.1
6.6	0.43	0.80	0.43	0.6
7.8	0.44	0.70	0.44	0.7
8.4	0.45	0.80	0.45	0.8
10.5	0.46	1.00	0.45	1.0
12.2	0.46	1.20	0.46	1.3
14.4	0.47	1.40	0.47	1.5

OUTPUT CHARACTERISTICS

V_{BB} (in V)	I_B = 0 μA		I_B = 20 μA	
	V_{CE} (V)	I_C (mA)	V_{CC} (in V)	I_C (mA)
2.8	0.1	0.440	0.1	0.702
6.6	0.2	0.520	0.2	1.281
7.8	0.4	0.601	0.4	1.812
8.4	0.5	0.602	0.5	1.907
10.5	0.6	0.604	0.6	1.911
12.2	0.8	0.608	0.8	1.914
14.4	1.0	0.610	1.0	1.918

CONCLUSION:

The input and output characteristics of a npn common emitter transistor were studied.

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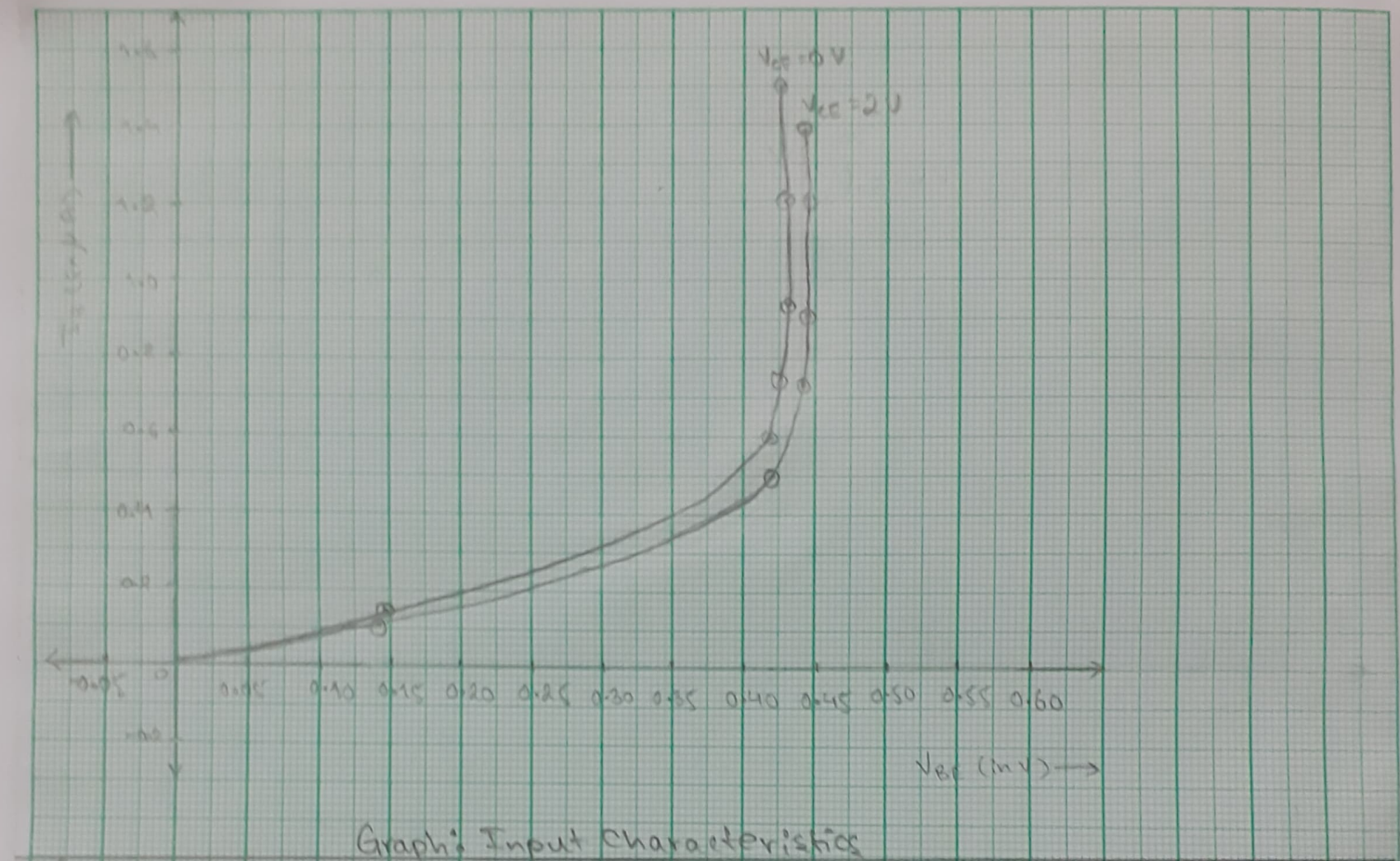
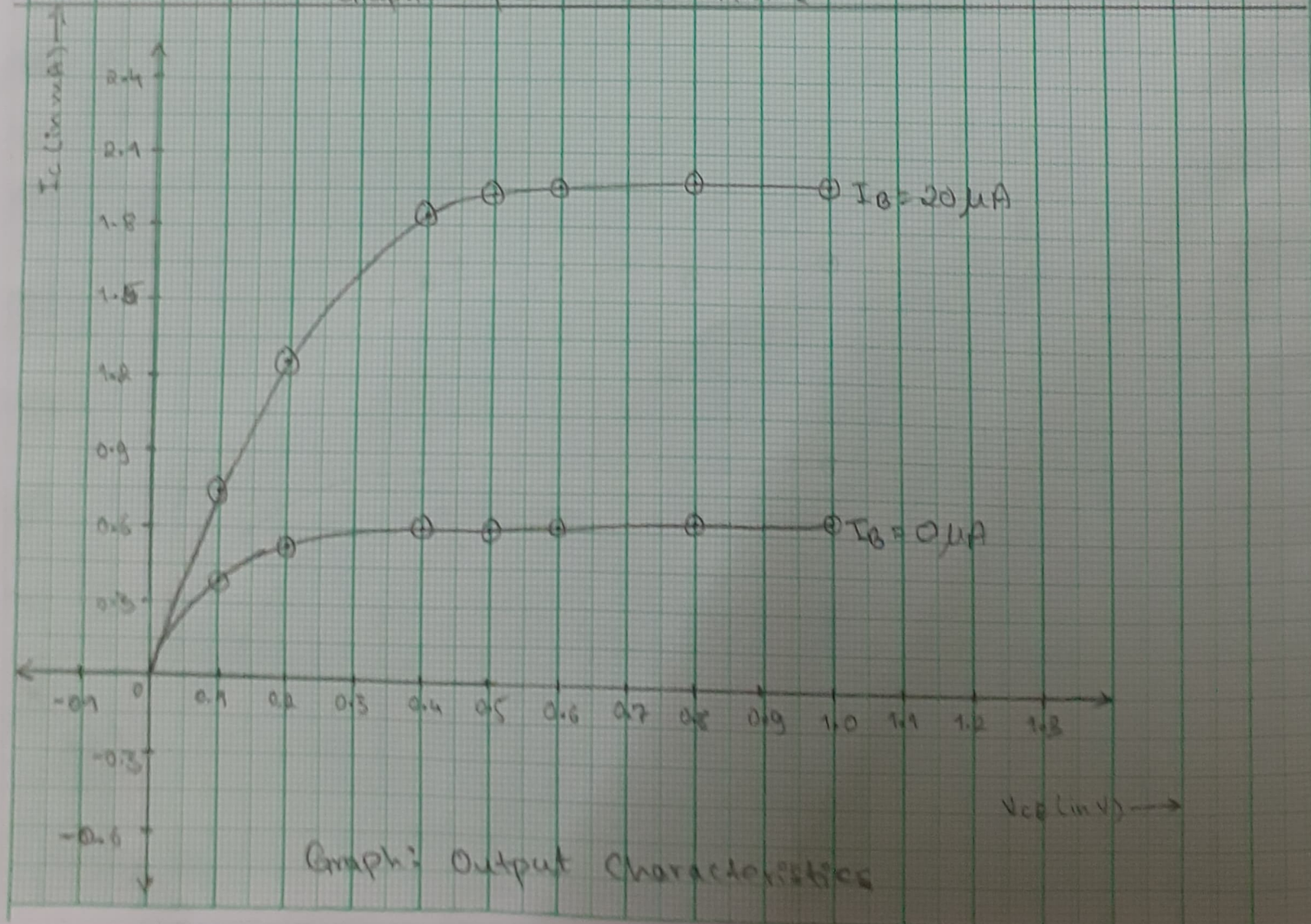


Graph: Input characteristics



Graph: Output Characteristics