

Name : Snehal Keshav Nalawade
Roll no. : 202151160

classmate

Date _____

Page _____

EC160 LAB EXP 6

Objective: To study the input and output characteristics of a p-n-p-n bipolar junction transistor in common-emitter mode and determine transistor parameters.

Theory:

- 1) Input characteristics: The variation of the base current I_B with the base-emitter voltage V_{BE} keeping the collector-emitter voltage V_{CE} fixed, gives the input characteristics in CE mode.

Input dynamic resistance (r_i): $r_i = \frac{\Delta V_{BE}}{\Delta I_B}$

- 2) Output characteristics: The variation of the collector current I_C with the collector-emitter voltage V_{CE} is called the output characteristic. The plot of I_C versus V_{CE} for different fixed values of I_B gives one output characteristic. Since the collector current changes with the base current, there will be different output characteristics corresponding to different values of I_B .

Output dynamic resistance (r_o): $r_o = \frac{\Delta V_{CE}}{\Delta I_C}$

- 3) Transfer characteristics: The transfer characteristics are plotted between the input and output currents (I_B versus I_C). Both I_B and I_C increase proportionately.
Current Amplification factor (β). $\beta = \frac{\Delta I_C}{\Delta I_B}$

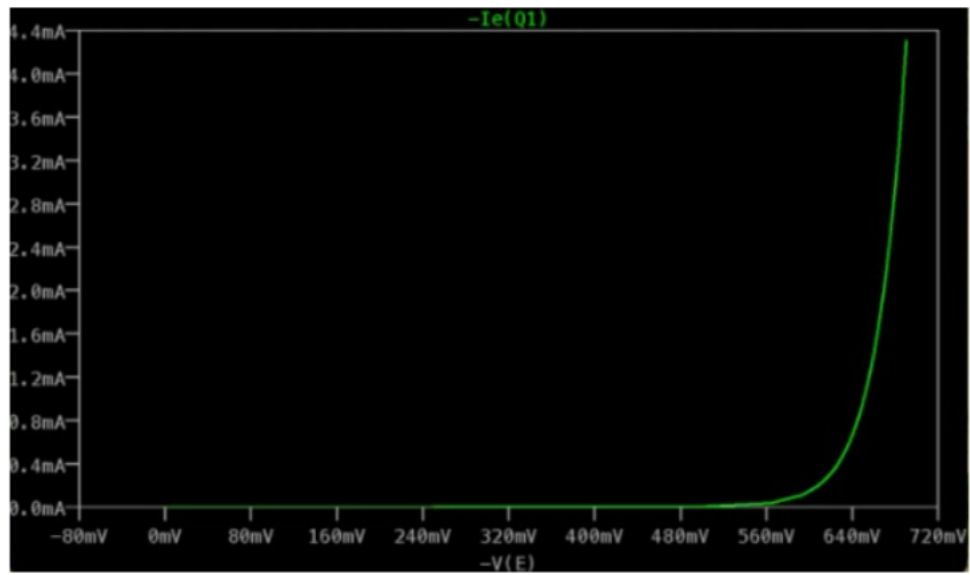
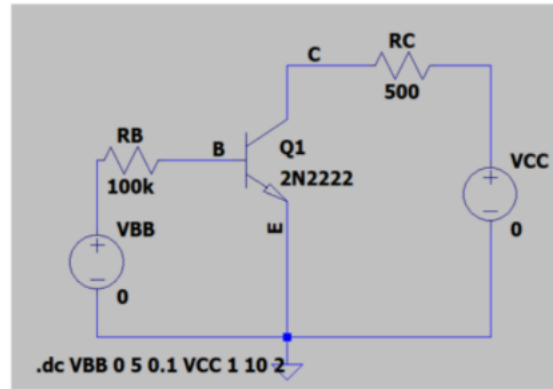
Transistor Code = 2N2222

Observation table :

I) Input characteristic :-

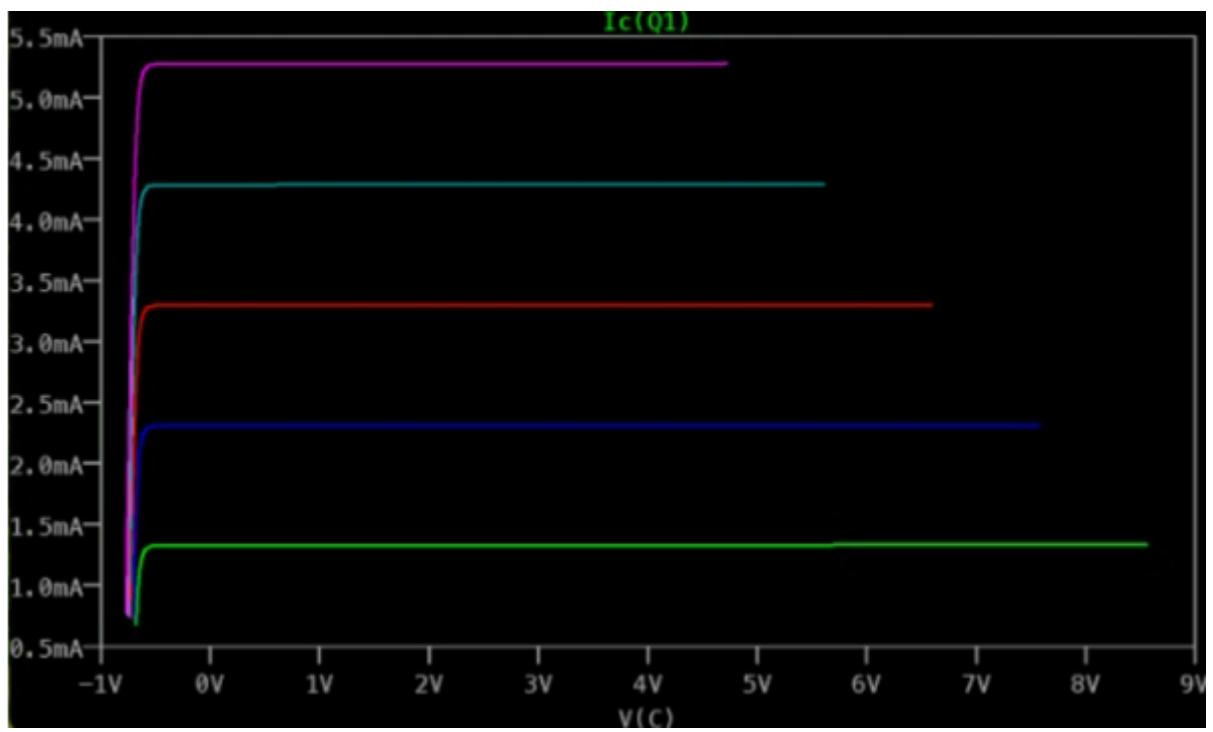
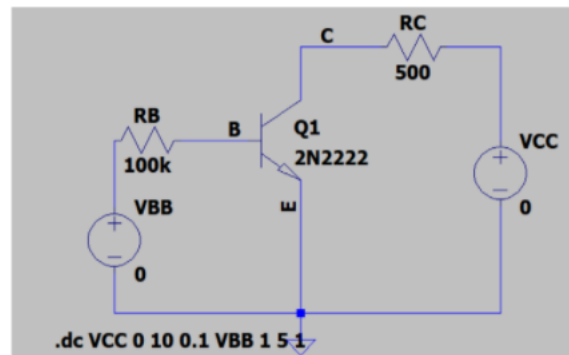
S.No.	$V_{CE} = 1 \text{ V}$			$V_{CE} = 10 \text{ V}$		
	$V_{BE} (V)$	$V_{RB} (V)$	$I_B (\mu A)$	$V_{BE} (V)$	$V_{RB} (V)$	$I_B (\mu A)$
	0.4	350×10^{-7}	310×10^{-6}	0.426	3.29×10^{-4}	3.29×10^{-3}
	0.475	9.08×10^{-4}	9.08×10^{-3}	0.56	0.16×10^{-1}	0.16
	0.65	0.408	4.08	0.66	0.604	6.04
	0.67	1.234	12.34	0.67	0.878	8.78
	0.55	161.68×10^{-4}	161.68×10^{-3}	0.6	0.69×10^{-1}	0.69
	0.32	52×10^{-7}	51.99×10^{-6}	0.35	123.5×10^{-7}	123.5×10^{-6}
	0.35	133×10^{-7}	133.4×10^{-6}	0.399	250×10^{-7}	250.2×10^{-6}
	0.42	2.6×10^{-4}	2.6×10^{-3}	0.475	9.06×10^{-4}	9.06×10^{-3}
	0.6	690×10^{-4}	690.4×10^{-3}	0.65	0.407	4.07

$$\text{Dynamic Resistance} = (670 - 650) \times 10^3 / (12.34 - 4.08) \\ = 2421.3 \Omega$$



II) Output characteristics:-

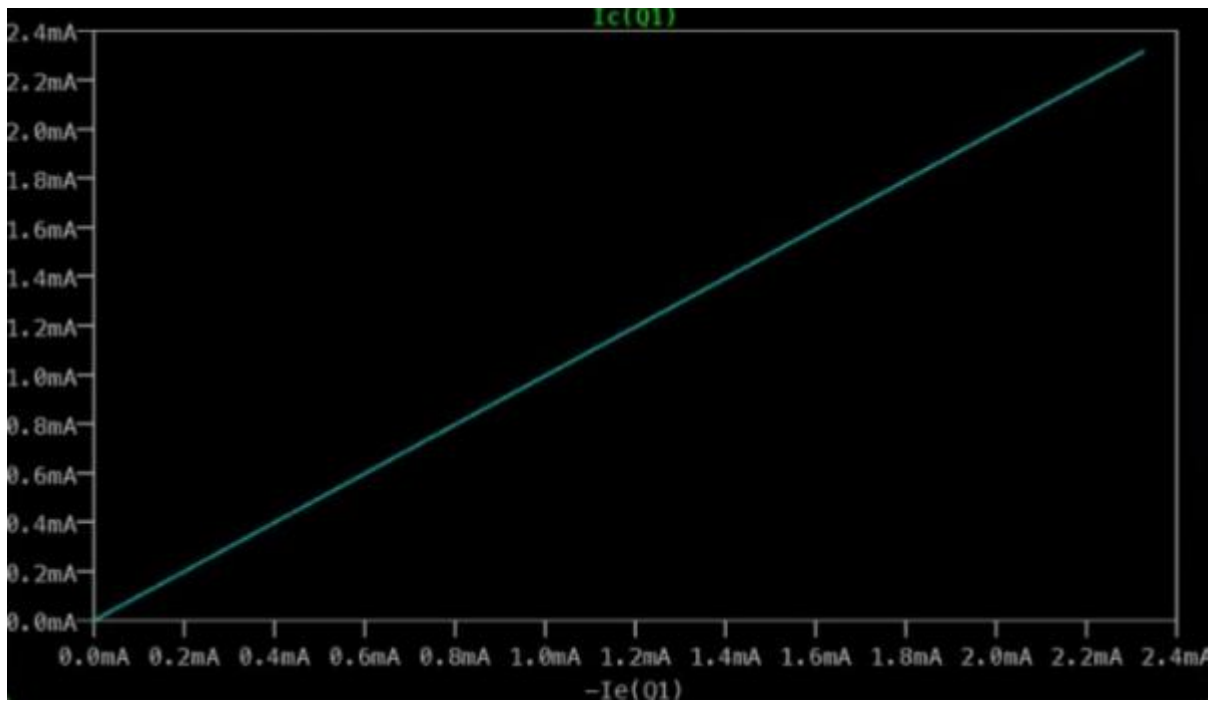
$I_{B1} = 20 \mu A$		$I_{B2} = 40 \mu A$		$I_{B3} = 10 \mu A$	
$V_{CE} (mV)$	$I_C (mA)$	$V_{CE} (mV)$	$I_C (mA)$	$V_{CE} (mV)$	$I_C (mA)$
98.4	1.75	154	6.89	98.4	1.02
295.2	4.51	350	8.31	295.2	2.62
49.2	0.345	49.2	0.625	49.2	0.212
350	4.52	98.4	3.18	154	2.19
154	3.78	295.2	8.29	350	2.62



III) Transfer characteristics.

	$I_B (\mu A)$	$I_C (mA)$
1	15.00	3.20
2	25.02	5.25
3	9.99	2.15
4	20.01	4.23
5	4.988	1.081

$$\beta = \frac{\delta I_C}{\delta I_B} = (5.25 - 4.23) \times 10^3 / (25.02 - 20.01) = 203.1$$



Thank You