Analog Electronic Circuits – Lab 4

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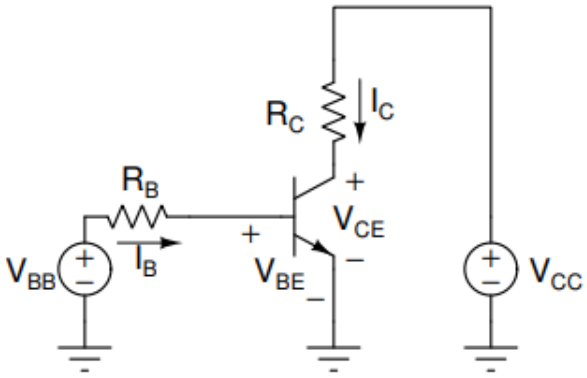
Experiment 1:

- Objective:

  To determine the characteristics of a bipolar junction transistor.

- Circuit Diagram:



- Procedure:

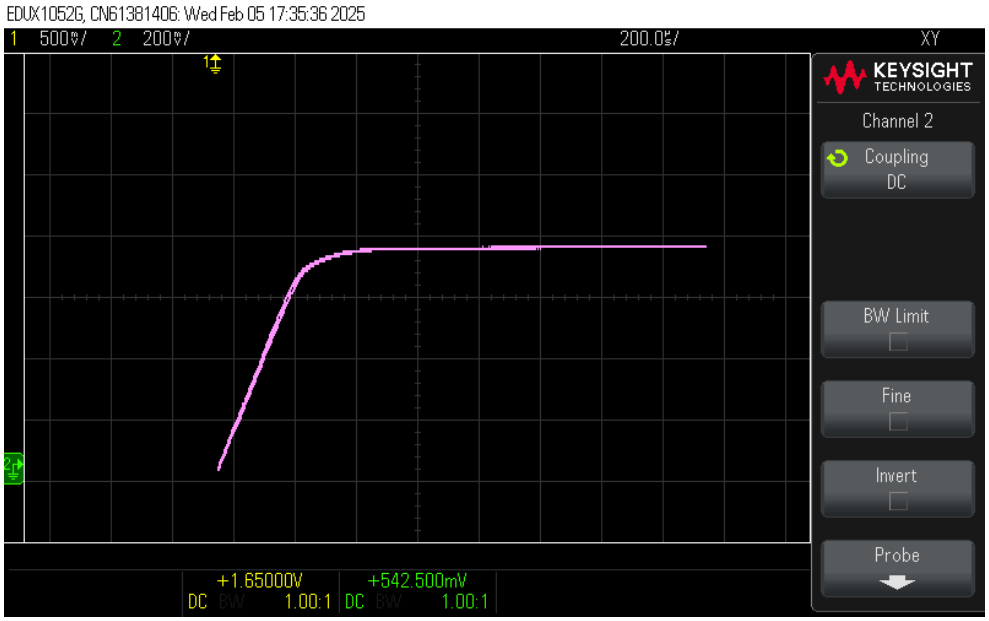
  1. Assemble the above circuit and generate a sinusoidal signal of amplitude 4V and offset 2V, to mimic a DC sweep analysis, at V_{BB}. Set V_{CC} = 20V, R_B = 10kΩ, R_C = 1kΩ.
  2. Find the XY plot for the above using the DSO.
  3. Find V_{BE} and V_{CE} for V_{BB} voltages 0.2V, 0.3V, 0.4V, 0.5V, …. 4V.
  4. Calculate I_B, I_C and β using the formulae,

$$I_B = \frac{V_{BB} - V_{BE}}{R_B}$$

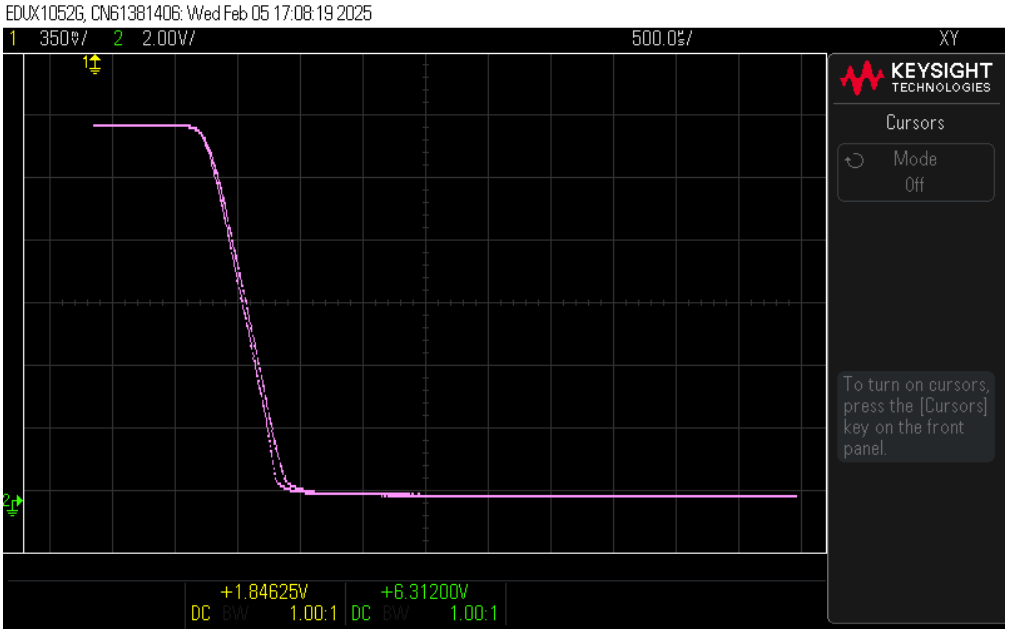
$$I_c = \frac{V_{CC} - V_{CE}}{R_C}$$

$$\beta = \frac{I_C}{I_B}$$

- Observations:



V_{BE} vs V_{BB}



V_{CE} vs V_{BB}

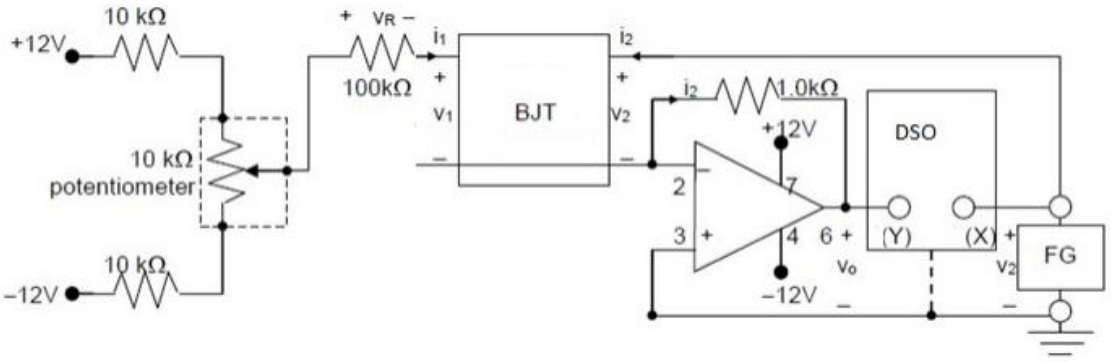
V_{BB} (V)	V_{BE} (V)	I_B (A)	V_{CE} (V)	I_C (A)	β
0.2	0.199	9.8039×10^{-8}	11.98	2E-05	204
0.3	0.299	9.8039×10^{-8}	11.98	2E-05	204
0.4	0.399	9.8039×10^{-8}	11.98	2E-05	204
0.5	0.498	1.9608×10^{-7}	11.97	3E-05	153
0.6	0.59	9.8039×10^{-7}	11.68	0.00032	326.4
0.7	0.638	6.0784×10^{-6}	9.86	0.00214	352.0645
0.8	0.657	1.402×10^{-5}	6.825	0.005175	369.1259
0.9	0.67	2.2549×10^{-5}	4.075	0.007925	351.4565
1	0.683	3.1078×10^{-5}	1.575	0.010425	335.4416
1.2	0.699	4.9118×10^{-5}	0.25	0.01175	239.2216
1.4	0.704	6.8235×10^{-5}	0.161875	0.011838	173.4898
1.6	0.705	8.7745×10^{-5}	0.1425	0.011858	135.1358
1.8	0.707	0.00010716	0.12825	0.011872	110.7885
2	0.708	0.00012667	0.11875	0.011881	93.79934
3	0.712	0.00022431	0.0925	0.011908	53.08413
4	0.716	0.00032196	0.078	0.011922	37.02935

Experiment 2:-

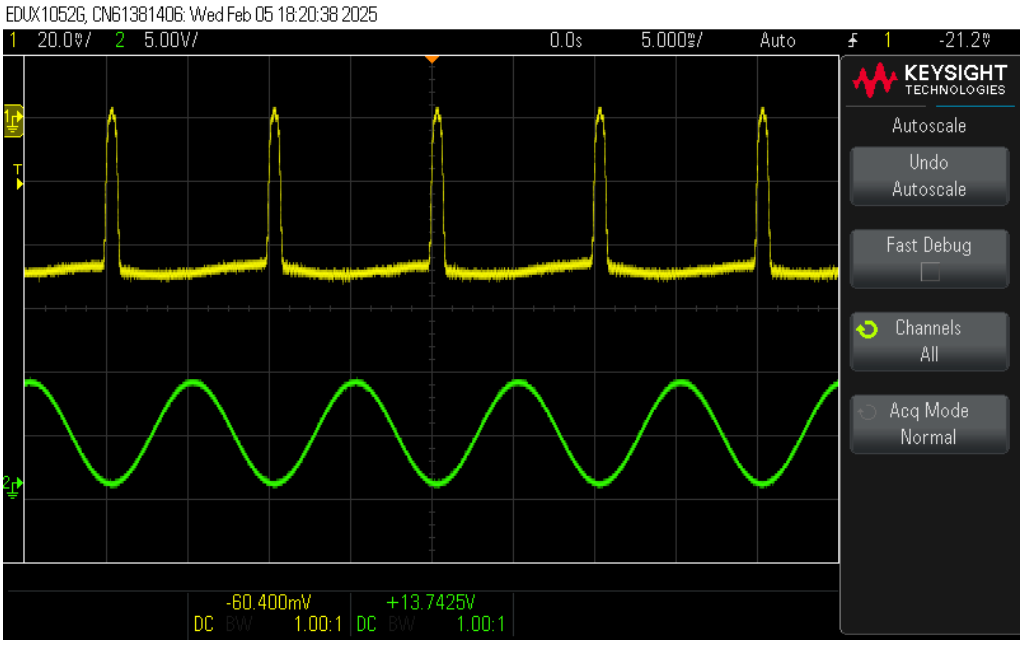
- ## Objective:

  To determine the output characteristics of a BJT.

- ## Circuit Diagram:



- ## Observations:-



Response at V_O

V_{BB} (V)	V_{BE} (V)	I_B (A)	V_{CE} (V)	V_O (V)
0.2	0.199	1×10^{-8}	3.97	0
0.3	0.277	2.3×10^{-7}	3.97	0
0.4	0.366	3.4×10^{-7}	3.98	0.001
0.5	0.492	8×10^{-8}	3.98	0.002
0.6	0.563	3.7×10^{-7}	3.98	0.0014
0.8	0.778	2.2×10^{-7}	3.98	0.0014
1	0.932	6.8×10^{-7}	3.97	0.0014
1.2	1.08	1.2×10^{-6}	3.97	0.0015
1.4	1.01	3.9×10^{-6}	3.97	0.0015
1.6	1.44	1.6×10^{-6}	3.98	0.0015
2	1.8	2×10^{-6}	3.98	0.0014
3	2.62	3.8×10^{-6}	3.96	0.0014