Practical No.16: Construct and test the circuit for BJT in common emitter configuration

I Practical Significance:

A BJT is commonly used as an amplifier. Common Emitter (CE) mode is the universal mode of operation for a BJT. All types of amplifications can be performed using CE mode with suitable biasing. Common-emitter amplifiers are also used in radio frequency circuits.

II Industry / Employer Expected Outcome

This practical is expected to develop the following skill: **'Use electronic components and circuits in electrical equipment and systems'.**

III Course Level Learning Outcome

Use semiconductor transistors in different applications.

IV Laboratory Learning Outcomes

Test the performance of BJT in CE mode:

1. Construct the circuit for BJT in common emitter configuration.
2. Plot input and output characteristics of common emitter configuration

V Relevant Affective Domain related Outcomes

1. Handle components and equipment with care.
2. Work in team.

VI Minimum Theoretical Background

CE is the most frequently used configuration in practical amplifier circuits, since it provides good voltage, current, and power gain. The input is applied across the base- emitter circuit and the output is taken from the collector-emitter circuit, making the emitter "common" to both input and output. CE configuration provides a phase reversal between input and output signals.

VII Practical setup in Laboratory

(a) Sample

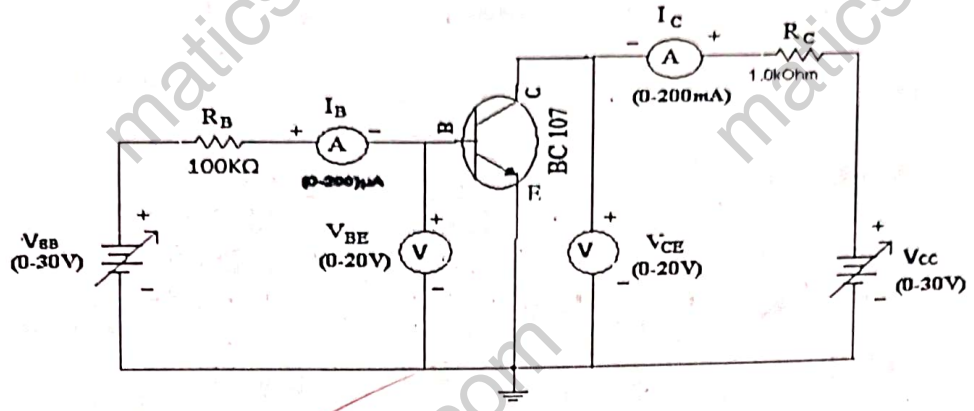
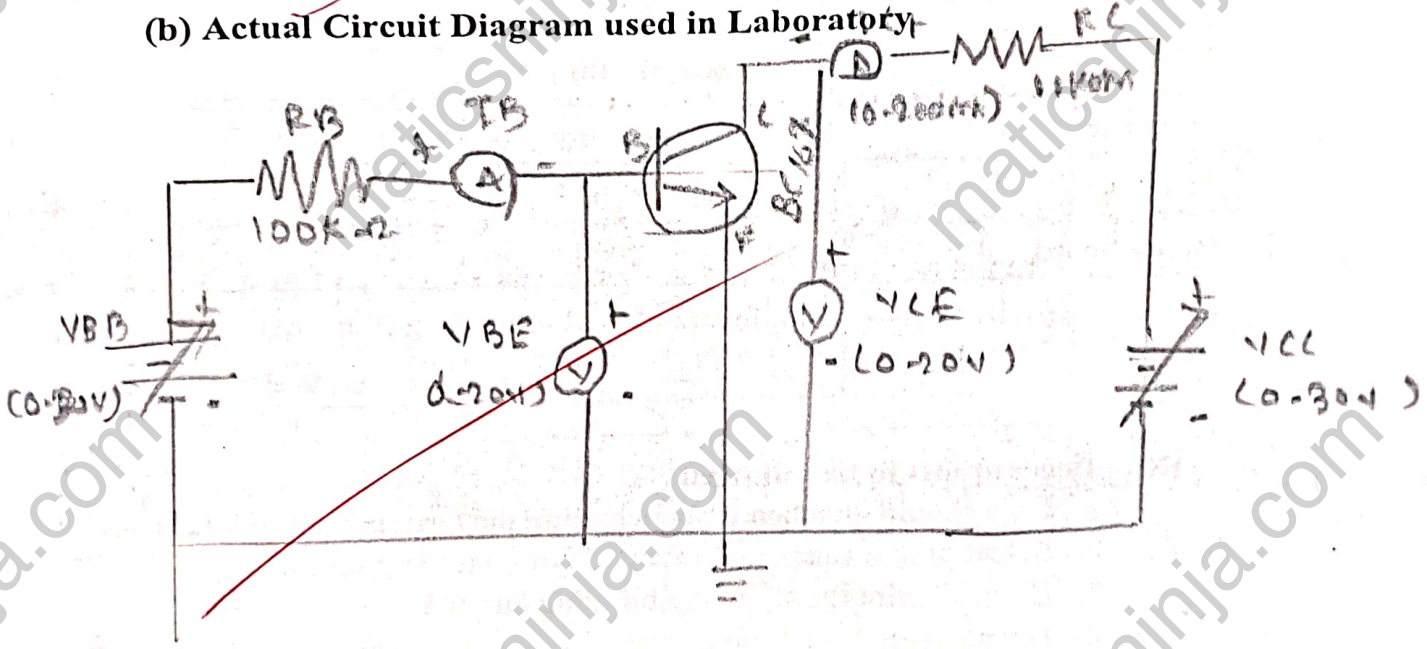


Figure 16.1: Circuit diagram of BJT in CE mode.

(b) Actual Circuit Diagram used in Laboratory



(c)Actual practical set up used in Laboratory

VIII Required Resources/apparatus/equipment with specifications

Sr. No	Instruments/Components	Specification	Quantity
1	Digital Multimeter	3 ½ -digit display with AC and DC voltage measurement and Current measurement facility and Diode testing facility.	1
2.	DC Regulated power supply	Variable DC power supply 0-30V, 2A, SC protection, display for voltage and current.	2
3.	DC Voltmeter	0-20V	2
4.	DC Ammeter	0-200 mA, 0-200 μA	1 each
5.	Transistor	BC107 or any other equivalent	1
6.	Resistor	1KΩ,100KΩ (0.5watts/0.25watts)	1 each
7.	Bread board	5.5 CM X 17CM	1
8.	Connecting wires	Single strand Teflon coating (0.6mm)	As per requirement

IX Precautions to be followed

1. Care should be taken while handling the terminals of components.
2. Select proper range and mode of Ammeter and voltmeter.
3. Connect wire tightly while building circuits.
4. Do not switch ON the power supply unless you have checked the circuit connections as per the circuit diagram.

X Procedure

Input characteristics:

1. Connect the circuit as shown in Figure 16.1
2. Set V_{CE} at constant voltage (2V) by varying Vcc.
3. Vary the input voltage V_{BE} in steps of 0.1V from 0V up to 1V and record the corresponding value of I_B in observation table.
4. Repeat the above steps 2 and 3 by keeping V_{CE} at 5V, and 10V.
5. Sketch the characteristics from the recorded readings.
6. At suitable operating point calculate input resistance (Ri).

Output characteristics:

1. Connect the circuit as shown in Figure 16.1
2. Set I_B constant at 10μA by varying V_{BB}.
3. Vary the output voltage Vcc in steps of 1V from 0V upto 10V and record the corresponding value of V_{CE} and I_c in observation table.

4. Repeat the above steps 2 and 3 by keeping I_B at 20μA and 30μA.
5. Sketch the characteristics from the recorded readings and calculate output resistance (Ro).

XI Observation Table

Table 1: Input Characteristics

Sr. No.	V_{CE}=2V		V_{CE}=5V		V_{CE}=10V	
	V_{BE} (V)	I_B (μA)	V_{BE} (V)	I_B (μA)	V_{BE} (V)	I_B (μA)
1.	0	10	0	10		
2.	5	0.7	5	7		
3.	10	0.6	10,	7		
4.	15	0.6	15	+7		
5.	20	0.6	20	7		
6.	25	0.6	25	7		
7.	30	0.6	30	7		
8.	35	0.6	35	7		
9.	40	0.6	30 40	7		
10.	45	0.6	45	7		

Table 2: Output Characteristics

Sr. No.	I_B=10μA		I_B=20μA		I_B=30μA	
	V_{CE}(V)	Ic(mA)	V_{CE}(V)	Ic(mA)	V_{CE}(V)	Ic(mA)
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

Calculations: *(from graph)*

1. Input resistance Ri: 18
2. Output resistance Ro: 20
3. Current amplification factor α. : 2

XII Results

.....We learned bjt used in common emitter configration.....

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XIII Interpretation of results

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.....In this pratical we perform characterstics of bjt.....

XIV Conclusions and Recommendation

.....The learning of this practival is how bjt works its performace and working.....

XV Practical related Questions

1. Repeat the same experiment using PNP transistor.
2. State current gain of the transistor in CE configuration. Find out DC current gain you obtain in this practical?

[Space for answers]

(1) - - - - ?

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→ Thus n-p-s is preffred as in this electrons have higher nobility than holes, which results is high mobility of energy, in a P-N-P transistor the positive supply lines becomes a which the ground current is basitive.

(2) - - - - ?

→ The amplication factor or current gain CE mode is defind as the ratio of the change in the collector current.