AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING (EEE)

EXPERIMENT NO.   **: 07**

NAME OF THE EXPERIMENT **: BIPOLAR JUNCTION TRANSISTOR (BJT): STUDY OF SINGLE STAGE TRANSISTOR COMMON EMITTER AMPLIFIER.**

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COURSE TITLE   **: ELECTRONIC DEVICES LABORATORY**

SECTION   **: Q**

GROUP NO.   **: 05**

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Objective of The Experiment:

The main objective of this experiment is to analyze the performance of a single stage transistor amplifier by tracing its circuit diagram and measuring various parameters such as β of the transistor, Q-point, maximum signal amplification without distortion, voltage gain at 1 kHz and voltage gain at different values of load resistance. The experiment aims to gain insights into the behaviour of the amplifier and its ability to amplify signal without introducing distortion.

List of Components:

1. Trainer Board,

2. Oscilloscope

3. Multimeter

4. Signal Generator.

5. DC Power supply $(+10V)$

6. Resistor $(33k\Omega, 3.3k\Omega, 1.5 k\Omega, 0.47k\Omega, 1k\Omega, 1k\Omega)$

8. Capacitor $(10\mu F, 10\mu F, 100\mu F)$
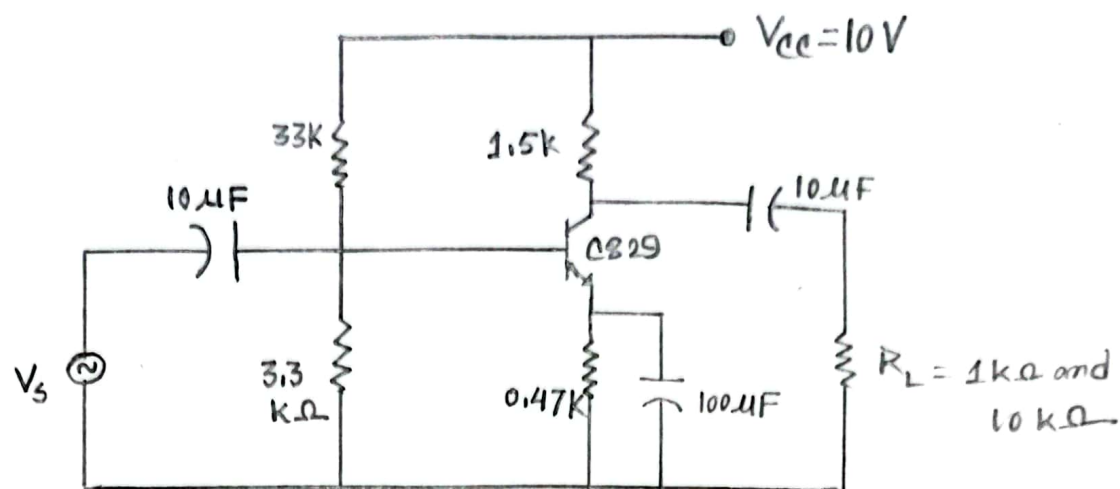
9. Transistor (C829) NPN

10. Cables.

Diagram:

Fig-1: Single stage CE Amplifier.

Working Principle of the Circuit:

In a single stage common emitter amplifier circuit we need 5 resistor, 3 capacitor, 1 DC source and 1 Ac source. AC Source connect accross a 10μF capacitor and DC source connect with a resistor which is connected with collector. After connect Ac and DC source we can measure Vc accross collector resistor. also we can determine VcE. After that we have to change the load resisto to find output and input voltage load resitor to determine voltage gain.

The emitter-follower configuration is frequently used for impedence-matching purpose. It present a high impedence at the point input and a low impedence at the output. The resulting effect is much the same as that obtained, where maximum signal transfer. [1]

Data and Calculation:

Data Table-1: Q-point of the amplifier

$V_{cc}(v)$	V_c (v)	$V_{cc} - V_c$ (v)	$I_c = (V_{cc}-V_c)/R_c$	V_{CE} (v)
10	4.01	5.99	3.993 mA	5.11

Data Table-2: Voltage gain of the amplifier.

Load Resistor	Input Voltage	Output Voltage	Gain
1 k	0.58 v	1.75 v	3.017 v
10 K	0.56 v	3.47 v	6.19 v

Calculation of Q-point of the amplifier:

$$I_c = \frac{V_{cc} - V_c}{R_c} = \frac{10 - 4.01}{1.5} = 3.993 \, mA$$

Calculation of voltage gain of the amplifier,

when, $R_L = 1 k\Omega$

$$Gain = \frac{1.75}{0.58} = 3.017 \, v$$

when, $R_L = 10 k\Omega$

$$Gain = \frac{3.47}{0.56} = 6.19 \, v$$

Discussion:

In this experiment we learned how to construct a single stage transistor amplifer circuit. we also familar Q-point and measure the maximum signal that can be amplified, without any distortion. Also we determine the voltage gain of amplifier at 1 kHz

while performing this experiment some errors might be occured, like while measuring values with multimetre some errors might occured. Also lack of connection it in breadboard create some errors as well.

we can solve this error by measuring all values multiple times and construct the circuit more carefully.

Conclusion:

By conducting this experiment we gain practical knowledge to analyze single stage common emitter transistor. We also achive our all goals as we discuss in objective parts.

Remarks:

The study of single stage Transistor common emitter amplifier is a fundamental experiment of us. It allow us to understand the maximum signal that can amplified with the amplifier without any distortion also how much voltage can be gained while amplified the signal.

List of References:

[1] Electronic Devices & Circuit Theory, 11th edittion page: 273

[2] American International University-Bangladesh (AIUB) Electronic Devices Lab Mannual.
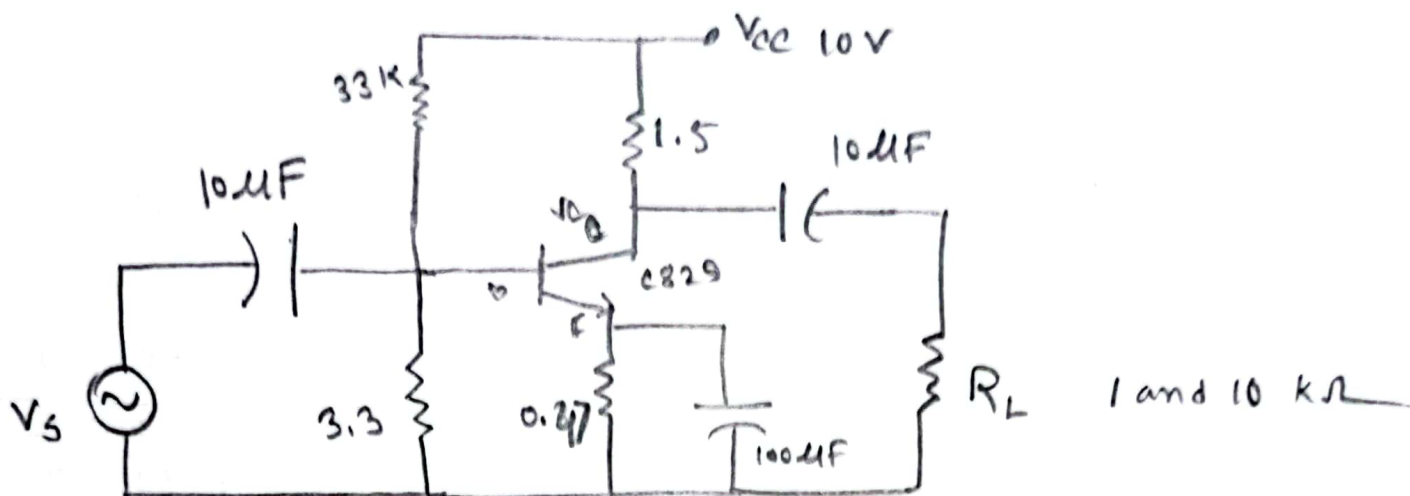
Q. point of the Amplifier:

V_{bc}	V_c	$V_{bb} - V_c$	$I_0 = (V_{cc} - V_c)/R_c$	V_{CE}
10V	4.01 V	5.99	3.993 mA	5.11 V

voltage gain of the amplifier:

Load Resistor	Input Voltage	Output Voltage	Gain
1 K	0.58 v	1.75 v	3.017 v
10 K	0.56 v	3.47 v	6.19 v