Experiment 4
Observation of Class A Multistage Amplifier

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1 Objective

1. To study the working principle of a Class A Multistage Amplifier.
2. To measure the voltage gain of the amplifier.

2 Apparatus

1. Transistors (2N3904 npn) - 2
2. Resistors (220 Ω, 1.2 kΩ, 3.6 kΩ, 20 kΩ, 10 kΩ)
3. Capacitors (10 μF) - 3
4. DC Power Supply (0-30V)
5. Function Generator
6. Oscilloscope
7. Multimeter
8. Breadboard, Connecting wires, etc.

3 Circuit Diagram

In the following page is given the circuit diagram for the Class A Amplifier. The multistage amplifier was built by connecting two amplifier circuits through the capacitor C_5. The output of the first amplifier (Q_1) acts as the input of the second amplifier (Q_3). The 10k Ω is the load resistor in the circuit. Oscilloscope has been connected in the shown way to get the input and output curves.

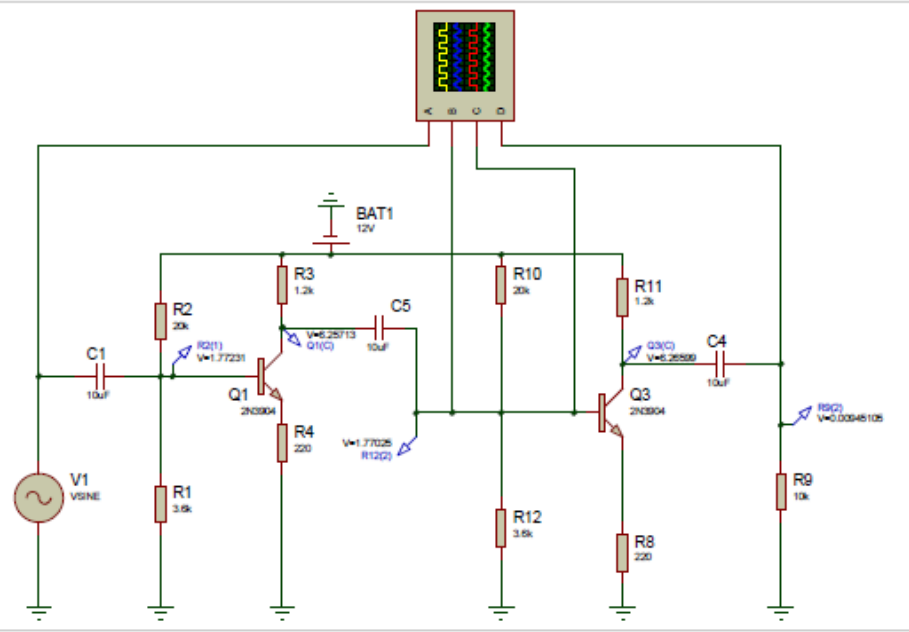


Figure 1: Class A Amplifier Circuit Diagram

4 Result Analysis

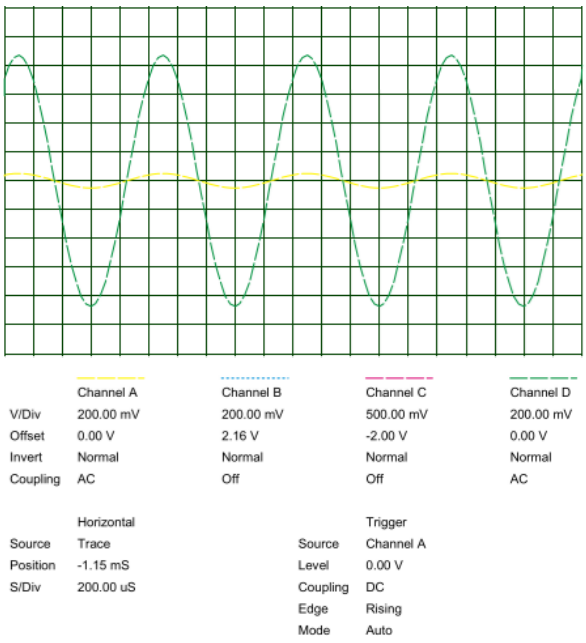
A multi stage amplifier amplifies a signal in multiple stages. The input of the first stage is amplified and collected at at the output terminal and that output becomes the input for the second stage. This is how a signal gets amplified in multiple stages. The overall voltage gain of the signal is going to be the multiplication of the voltage gain of each of these circuits.

4.1 Data Table for Class A Multistage Amplifier

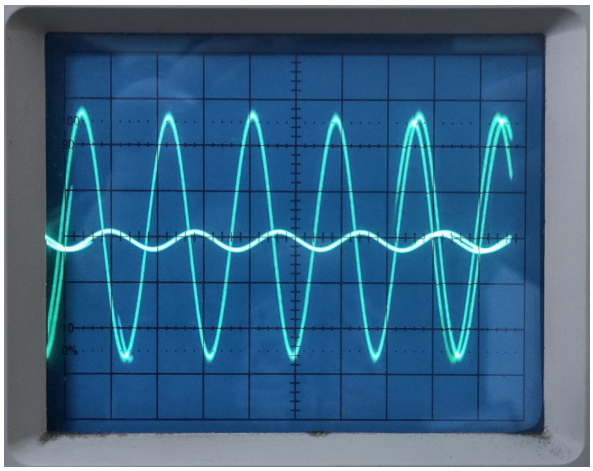
Table 1: Data table for Class A multistage amplifier

Theoretical Data						
V_{in} (mV)	V_{out} (mV)	I_{in} (μA)	I_{out} (μA)	A_V	A_I	A_P
50	620	19.2	61.81	12.4	3.22	39.93
Simulation Data						
V_{in} (mV)	V_{out} (mV)	I_{in} (μA)	I_{out} (μA)	A_V	A_I	A_P
50	617	19.2	61.7	12.34	3.21	39.61
Practical Data						
V_{in} (mV)	V_{out} (mV)	I_{in} (μA)	I_{out} (μA)	A_V	A_I	A_P
50	572	15.2	65.7	11.44	4.32	49.42
Error Analysis (Simulation vs Practical Data)						
V_{in} %	V_{out} %	I_{in} %	I_{out} %	A_V %	A_I %	A_P %
0	10.86	20.83	6.48	0.38	34.58	24.77

4.2 Class A Multistage Amplifier Input and Output Graphs



(a) Simulated Graph



(b) Experimental Graph

Figure 2: Simulated and Practical Input and Output Graphs for Class A Multistage Amplifier

In the simulated graph (Figure 2-a), the yellow and the green dashed lines show the input and output curves respectively. In the practical graph (Figure 2-b), the shorter amplitide curve is input graph and the other one is output curve.

5 Discussion

The experiment was conducted to observe the amplification of a signal in multiple stages. Error had been measured between the simulated data and the practical data. The error analysis shows that the accuracy of the practical data is roughly within the range of 75% to 90%. The theoretical, simulation and practical data had some discripancies. One of the possible reason for this was that in the theoretical and simulated data, the internal resistance of wires and other equipments were considered negligible.