EXPERIMENT NO.3

TITLE: OP-AMP AS AN INVERTING FEEDBACK AMPLIFIER & INVERTER.

OBJECTIVES:

1. To observe & plot the output waveform for inverting feedback amplifier circuit.
2. To calculate the closed loop gain for inverting feedback amplifier circuit.
3. To observe & plot the output waveform for inverter circuit.

LAB REQUIREMENTS:

Breadboard, Op-amp IC 741, Resistors(R1& Rf), DC regulated power supply (0-30V), Function Generator, Oscilloscope and connecting wires/Probes.

CIRCUIT DIAGRAM:

1. **Inverting feedback amplifier circuit using op-amp IC 741:**

2. **Inverter Circuit using Op-amp IC 741:**

THEORY:

a) Inverting feedback amplifier circuit using op-amp IC 741:

The circuit shown in **(1)** is commonly known as an inverting amplifier with feedback (or closed loop an inverting amplifier) because it uses feedback and the input signal is applied to the inverting input terminal of an op-amp. It is also called as voltage shunt feedback amplifier.

Specifically voltage gain of op-amp with and without feedback, and the gain of the feedback circuit are defined as follows:

Open loop voltage gain (gain without feedback) $\boldsymbol{A = \frac{v_o}{v_{id}}}$

Closed loop voltage gain (gain with feedback) $\boldsymbol{A_F = \frac{v_o}{v_{in}}}$

Gain of feedback circuit $\boldsymbol{B = \frac{v_f}{v_o}}$

Ideally the gain of the an inverting feedback amplifier is determined by the ratio of two resistors R_1 & R_F and is given as-

$$\boldsymbol{A_F = -\frac{R_F}{R_1}}$$

b) Voltage Follower Circuit using Op-amp IC 741:

The circuit shown in **(2)** is commonly known as an inverter circuit because the output voltage is equal in amplitude and out of phase (phase shifted by 180°) with the input. Inverter is the special case of inverting feedback amplifier. The inverting amplifier works as an inverter if $\boldsymbol{R_F}$**.** In this circuit the output is fed back into inverting terminal of an op-amp.

Ideally the gain of the inverter circuit is given as-

$$\boldsymbol{A_F = -1}$$

$$\textbf{i.e. } \boldsymbol{v_o = -v_{in}}$$

EXPERIMENTAL PROCEDURE:

1. Refer the Pin Diagram of op-amp IC741 & assemble the circuits as per circuit diagram on the breadboard.
2. Apply V_{CC} & V_{EE} = ±15V from DC regulated power supply.
3. Apply AC Input Signal of suitable amplitude and frequency from the function generator.
4. Measure the output voltage & note the readings in the observation table.
5. Observe the output waveforms on oscilloscope.

6. Plot the waveforms on the graph paper.

OBSERVATION TABLE:

A) Op-amp as an inverting feedback amplifier:

Sr. No.	Input Voltage Frequency (Hz)	Input Voltage Amplitude (V p-p)	R1(KΩ)	R_F (KΩ)	Output Voltage Amplitude (V p-p)	Voltage Gain	
						Theo.	Prac.
1							
2							

B) Op-amp as an inverter:

Sr. No.	Input Voltage Frequency (Hz)	Input Voltage Amplitude (V p-p)	R1(KΩ)	R_F (KΩ)	Output Voltage Amplitude (V p-p)	Voltage Gain	
						Theo.	Prac.
1							
2							

CALCULATIONS:

RESULT:

1. **For an inverting feedback amplifier using op-amp, practical value of closed loop gain is found to be_____.**
2. **For an inverter circuit using op-amp it is observed that_____.**

EVALUATION (BY TEACHER):

Excellent/Good/Average/Poor