

EXPERIMENT NO.8

TITLE: OP-AMP AS BASIC COMPARATOR.

OBJECTIVES:

1. To assemble the circuit of non-inverting comparator using op-amp IC 741.
2. To observe and plot the output voltage waveform of non-inverting comparator for sine wave input.

LAB REQUIREMENTS:

Breadboard, Op-amp IC 741, DC regulated Dual power supply (0-30V)-2Nos., Function Generator, CRO/DSO and connecting wires/Probes.

CIRCUIT DIAGRAM:

THEORY:

A Comparator is a circuit which compares signal on one input of op-amp with a reference voltage on the other input. In a simplest form it is nothing more than an open loop op-amp with two analog input and a digital output. Output of comparator may be (+) or (-) saturation voltage, depending upon which input is larger. Comparators are widely used in the circuits such as digital interfacing, Schmitt triggers, discriminators, voltage level detectors and oscillators.

Above circuit shows the basic comparator in non-inverting configuration of op-amp. A fixed reference voltage (V_{ref}) is applied at the negative input of the op-amp and time varying signal voltage V_{in} is applied at the positive input of an op-amp. Because of this arrangement, this circuit is called as non-inverting comparator.

Output of this circuit can be +ve or -ve V_{sat} depending upon the condition mentioned below:

$$\text{If } V_{in} < V_{ref}, v_o \cong -V_{SAT} \text{ \& for } V_{in} > V_{ref}, v_o \cong +V_{SAT}.$$

In this comparator circuit two antiparallel diode may be used which protect the op-amp from damage due to excessive input voltage. Due to this diodes, the difference input voltage v_{id} of the op-amp is clamped either at 0.7V or -0.7V. Also to reduce the offset problem resistance R_{OM} may be used at the input side.

EXPERIMENTAL PROCEDURE:

1. Refer the Pin Diagram of op-amp IC741 & assemble the basic comparator in inverting configuration circuit as per circuit diagram on the breadboard.
2. Set the DC power supply to provide $+V_{CC}$ & $-V_{EE}$ by making necessary adjustment & Apply V_{CC} & $V_{EE} = \pm 15V$ at respective pins of op-amp IC 741.
3. Set the function generator to provide 2V (p-p) sine wave at 500HZ & Apply this AC input at pin 2 (INV) of op-amp IC741.
4. Set the DC power supply to provide 0.5V reference voltage by making necessary adjustment & Apply this reference voltage signal at pin 3 (NI) of op-amp IC 741.
5. Observe the output of this circuit on CRO/DSO.
6. Measure the output voltage swing .Note the readings in the observation table.
7. Plot the output voltage waveforms for v_{in} and V_{ref} .

OBSERVATION TABLE:

Sr. No.	Input Voltage Amplitude (Vp-p)	Input Voltage Frequency (Hz)	Vref (V)	Output Voltage Amplitude (Vp-p)
1				

RESULT:

1. Circuit of basic comparator using op-amp IC 741 has been assembled in _____configuration of op-amp with input _____wave signal set at _____amplitude & _____frequency.
2. It has been observed from the output waveform that output is _____wave for _____wave input.
3. Output of this circuit is $+V_{sat}$ when _____& $-V_{sat}$ when _____.

EVALUATION (BY TEACHER):

Excellent/Good/Average/Poor