



Name: _____

Roll # : _____

Score: _____

Signature: _____

Date: _____

Comparator

OBJECTIVE:

- To understand the operation of Op-amp used as an comparator

EQUIPMENTS:

- Oscilloscope.
- Function generator.
- DC power supply ($\pm 12V$).
- Digital Multimeter.
- Breed board
- Connecting wires.
- Op-Amp I.C 741.
- Few Resistors

THEORY DISCUSSION:

Operational amplifiers are often used as comparators to compare amplitude of one voltage with another. In this application the op-amp is used in open loop configuration, with input voltage on one terminal and reference voltage on other terminal. Hence as a comparator the op-amp operates non-linearly.

Comparators are also used to determine when an input voltage exceeds a certain level. There are two configurations of comparator.

1. Zero level detection.

It is used to determine when the input voltage exceeds a certain ('0' V) level. Figure 1(a) shows a zero level detector, while the figure 1(b) shows the sinusoidal input response of the non-inverting input of the zero level detector.

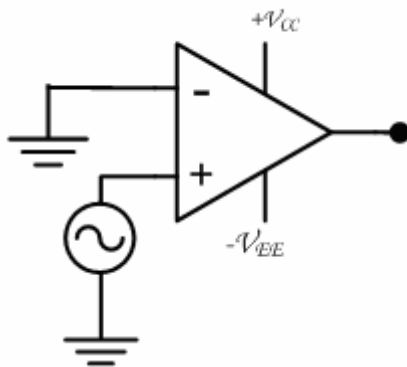


Figure 1(a)

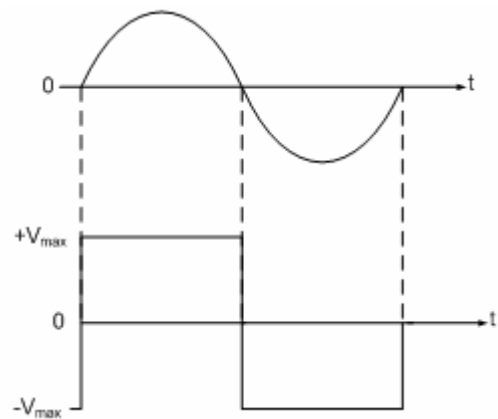


Figure 1(b)

2. Non-Zero level Detection.

Modification of the zero level detector to detect positive and negative voltages by connecting a reference voltage source to inverting input, as shown in figure.

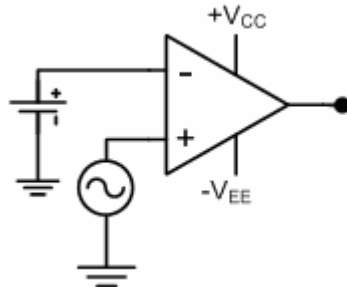


Figure 2(a)

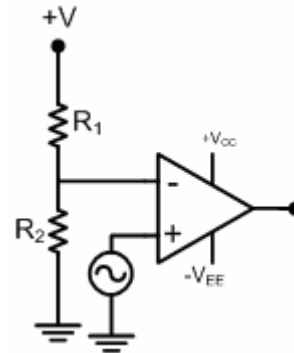
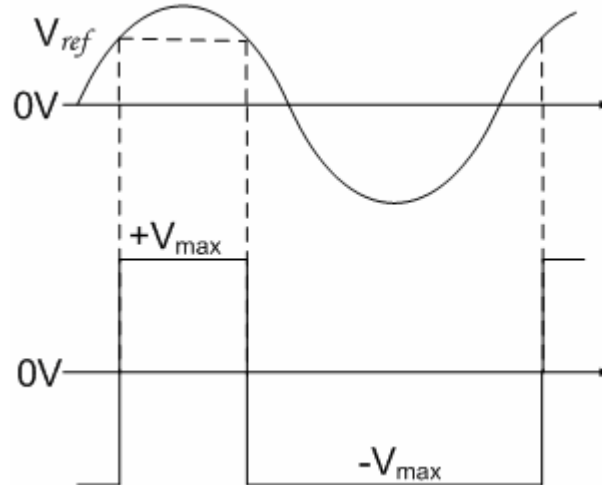


Figure 2(b)

$$\text{Where } V_{ref} = \frac{R_2}{R_1 + R_2} (+V)$$

When the input voltage exceeds the reference voltage, the output goes to its maximum positive voltage, as shown in figure, with a sinusoidal input voltage.



PROCEDURE:

1. Arrange the circuits shown in figure 2(a).
2. By setting the reference voltage to 0.25V (DC) and applying the input signal of 500mV_(pk), observe the output.
3. Notice that when the input signal exceeds the reference voltage the output jumps to maximum.
4. Now arrange the circuit shown in figure 2(b), with V= 5volts, R₁=1KΩ and R₂ = 560 Ω.
5. By applying the same 2V_(pk) signal observe the output.
6. Notice that the area covered by output at negative side is greater than that of on positive side.



Review Question

Q # 01. What is a Comparator?

Ans:

Q # 02. How the op-amp operates when used as a comparator (linearly or non-linearly)?

Ans:

Q # 03. Was there any feedback used in comparator? Which one?

Ans:

Q # 04. Why we use zero level detection?

Ans:

Q # 05. What will happen to output wave width if peak input voltages are increased (below reference voltage)?

Ans:

Q # 06. What will be the output if peak input voltages are increased above reference voltages?

Ans:
