Topic:- Comparator

A voltage Comparator or simply a comparator is a device used for the comparison of two voltage levels. The output of the comparator indicates which of the two input voltage is greater. Hence it is a switching device, given an output voltage when one input voltage is larger and another out voltage when the other input voltage is larger.

An OPAMP can be used as a comparator by operating it in the ~~loop~~ open-loop condition. A comparator has two input voltages, non inverting and inverting, and one output voltage as shown in fig (1). Because of the high open-loop voltage gain of an OPAMP, a very small differential voltage between the two inputs drives the amplifier to saturation. i.e if the voltage to the non-inverting input terminal V_1 slightly exceeds the voltage to the inverting input terminal (V_2), the OPAMP quickly switches to the maximum positive output voltage V, and if v_2 is slightly greater than v_1, the OP AMP switches to the maximum negative output voltage $-V$. The output voltage v_o switches when $v_d = v_1 - v_2 = 0$.

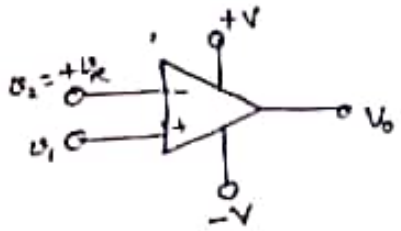

Fig (1): An OPAMP Comparator

In fig (1), +V and −V supply voltages in an open-loop OPAMP. A dc source of voltage $+V_R$ is connected to the inverting input and a sinusoidal voltage $v_i = V_m \sin\omega t$ is applied to the non-inverting input ($V > V_m > V_R$). Fig (2) displays the Comparator output voltage v_o. The output voltage v_o switches to +V whenever v_i exceeds V_R. v_o stays at V as long as $v_i > V_R$ when v_i drops below V_R, the comparator output switches to −V.

Sometimes the inverting or the non-inverting input terminal is grounded. The comparator then acts as a zero-crossing detector.

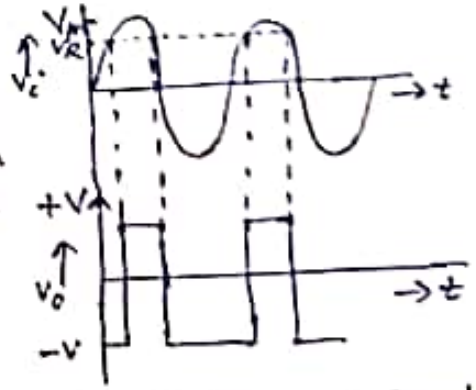

Fig (2): Input and output voltages of the Comparator.