5.6 Oscillators

An oscillator may be described as a source of alternating voltage. It is different than amplifier.

An amplifier delivers an output signal whose waveform corresponds to the input signal but whose power level is higher. The additional power content in the output signal is supplied by the DC power source used to bias the active device.

The amplifier can therefore be described as an energy converter, it accepts energy from theDC power supply and converts it to energy at the signal frequency. The process of energy conversion is controlled by the input signal, Thus if there is no input signal, no energy conversion takes place and there is no output signal.

The oscillator, on the other hand, requires no external signal to initiate or maintain the energy conversion process. Instead an output signals is produced as long as source of DC power is connected. Fig. 5.6.1, shows the block diagram of an amplifier and an oscillator.

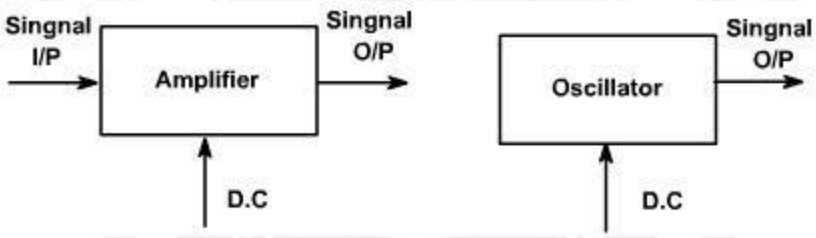

Fig. 5.6.1 amplifier Oscillators

[Source: "Electronic devices and circuits" by "Balbir Kumar, Shail.B.Jain, and Page: 165]

Oscillators may be classified in terms of their output waveform, frequency range components, or circuit configuration.

If the output waveform is sinusoidal, it is called harmonic oscillator otherwise it is called relaxation oscillator, which include square, triangular and saw tooth waveforms.

Oscillators employ both active and passive components. The active components provide energy conversion mechanism. Typical active devices are transistor, FET etc.

Passive components normally determine the frequency of oscillation. They also influence stability, which is a measure of the change in output frequency (drift) with time, temperature or other factors. Passive devices may include resistors, inductors, capacitors, transformers, and resonant crystals.

Capacitors used in oscillator's circuits should be of high quality. Because of low losses

Damped Oscillations

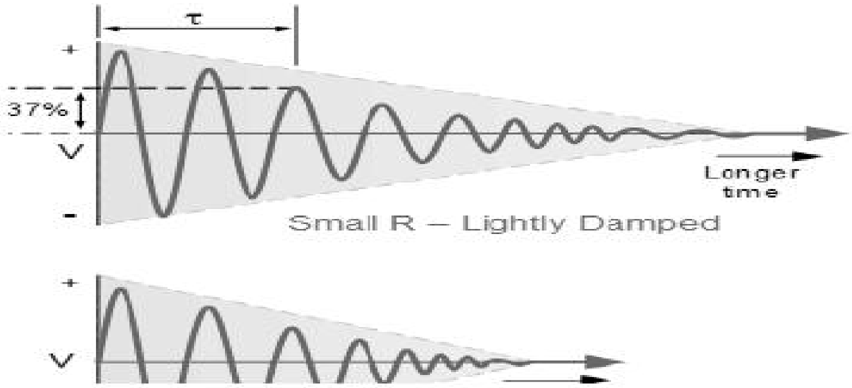

Fig. 5.6.2 Damped Oscillations

[Source: "Electronic devices and circuits" by "Balbir Kumar, Shail.B.Jain, and Page: 165]

The frequency of the oscillatory voltage depends upon the value of the inductance and capacitance in the LC tank circuit. We now know that for resonance to occur in the tank circuit, there must be a frequency point were the value of XC, the capacitive reactance is the same as the value of XL, the inductive reactance (XL = XC) and which will therefore cancel out each other out leaving only the DC resistance in the circuit to oppose the flow of current.

If we now place the curve for inductive reactance on top of the curve for capacitive reactance so that both curves are on the same axes, the point of intersection will give us the resonance frequency point, (fr or ωr) as shown below.