Demodulation (or) Detection

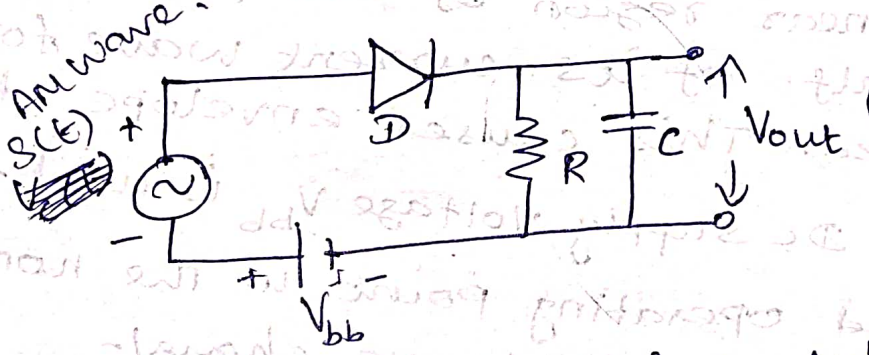
Demodulation (or) detection is nothing but the process of extracting a modulating (or) baseband signal from modulated signal. Otherwise demodulation is the process by which the message is recovered from the modulated signal at the receiver.

Detectors are categorized by,

(i) Square law detectors (or) nonlinear detectors.

(ii) Envelope detector (or) linear detector.

Square law detector:
(nonlinear).



Mainly the low level modulated signals are using non linear detectors to recover the original message signal.

Square law detector ckt is used for detecting modulating signal of small magnitude.

A device is said to be nonlinear if the o/p is not a linear func- of the i/p amplitude. ie a device should work in the nonlinear por -tion of its transfer func-.

The circuit is very similar to square law modulator, the only diff/- being the filter circuit.

In the detector the filter circuit is a LPF instead of a BPF used in modulator.

Here a diode can be used as a square law detector if it is made to operate in the non linear portion of its dynamic VI char/- operation.

When modulated signal is applied at the detector I/P the operation takes place over the nonlinear region of char/- results in the lower half of its current wave form is compressed. This causes envelope distortion

The DC supply voltage V_{bb} is used to get the fixed operating point in the nonlinear portion of the diode VI char/-.

The average diode current of the detector consists of steady (or) DC component and all time varying ac component at the modulation freq/-. i, current doesn't remain constant and varies with time.

The O/P of the diode passes thro' RC combination and capacitor C bypass all the RF (ac) components leaving only the average RC combination dc components and modulating freq/- terms to flow thro' the R_L. thus producing the desired detected O/P.

If the capacitor charges to the peak value the diode stops conducting.

The capacitor will discharge through R b/w the +ve peaks.

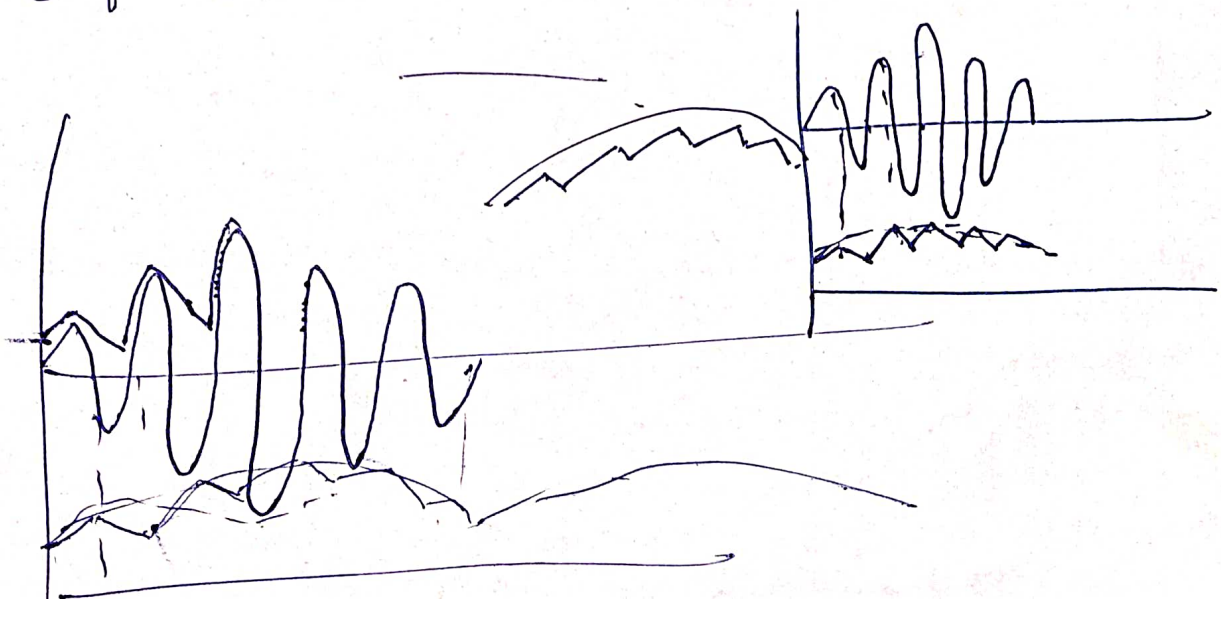
This discharging process continues until the +ve half cycle.

When the i/p signal becomes greater than the capacitor voltage, the diode conducts again and the same process repeats.

In -ve half cycle, the diode is reverse biased and no current flows.

Thus +ve cycle again charges the capacitor to the peak value of the carrier voltage and that this process repeats again & again.

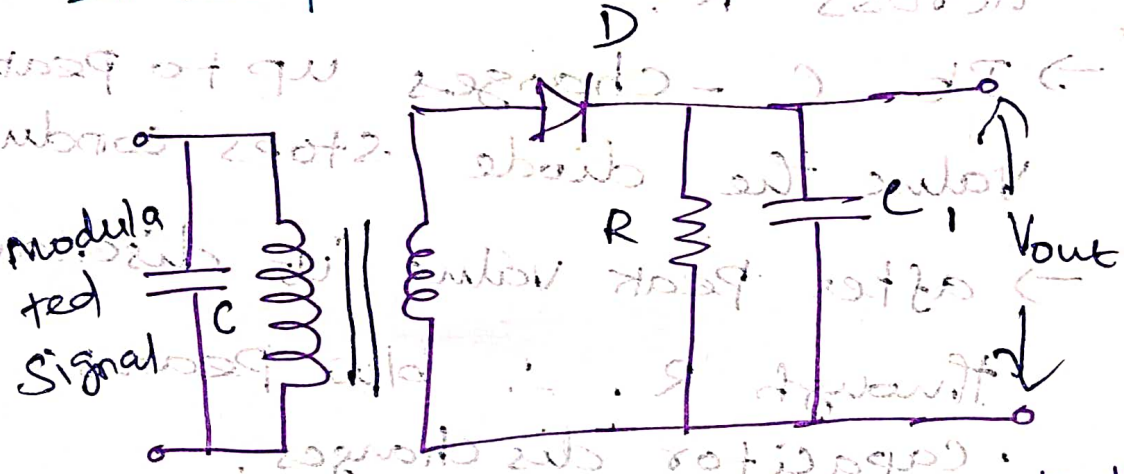
So the o/p voltage across the capacitor is a modulating (or) base band signal, so the envelope is detected. at the o/p of capacitor.

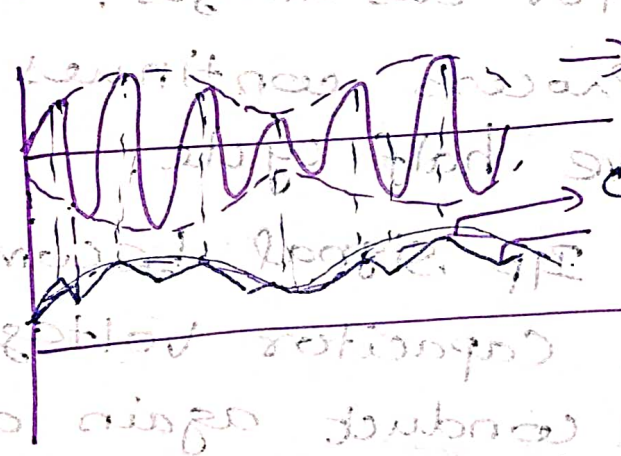


Demodulation (or) Detection:

It is the Process of extracting a modulating (or) message signal from modulated signal at the Receiver.

Envelope Detector:





→ A diode operate in linear region of its transfer characteristics can extract the envelope of an AM wave.

→ A detector circuit whose o/p follows the envelope of the modulated signal which is used to reproduce the modulating or message signal is called as "envelope detector".

Operation:

→ In every +ve half cycle the diode is Forward bias.

→ It will charge the filter ie capacitor 'C'. It is connected across R.

→ It C - charges up to peak value the diode stops conducting

→ after peak value it discharge through R. ∴ b/w peaks capacitor discharges.

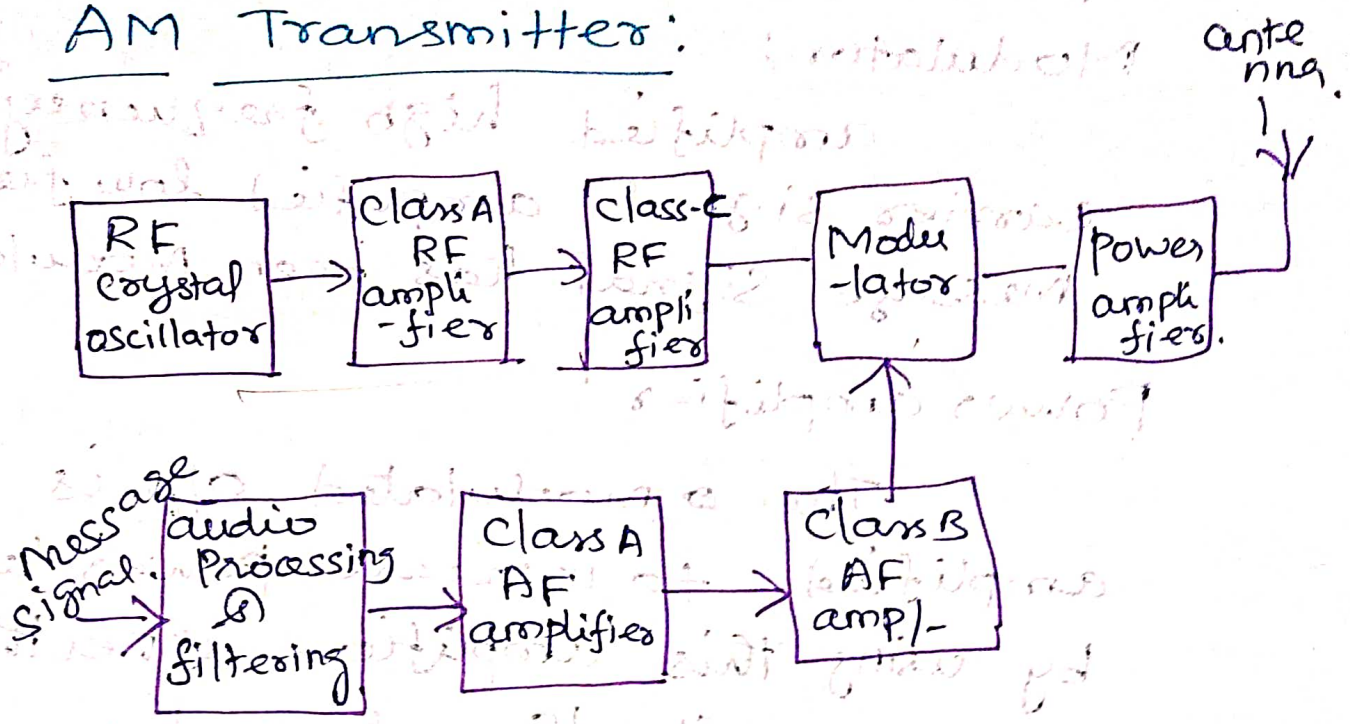
→ This process continues until the +ve half cycle.

→ When I/P signal becomes greater than the capacitor voltage, the diodes conduct again and the same process repeats.

→ In -ve half cycle, the diode is reverse biased and no current flows.

→ Finally envelope of message signal detected.

AM Transmitter:



RF crystal oscillator:

This will generate carrier signal.

Class A & class C RF amplifier:

The carrier signal is amplified to adequate power level using this amplifiers.

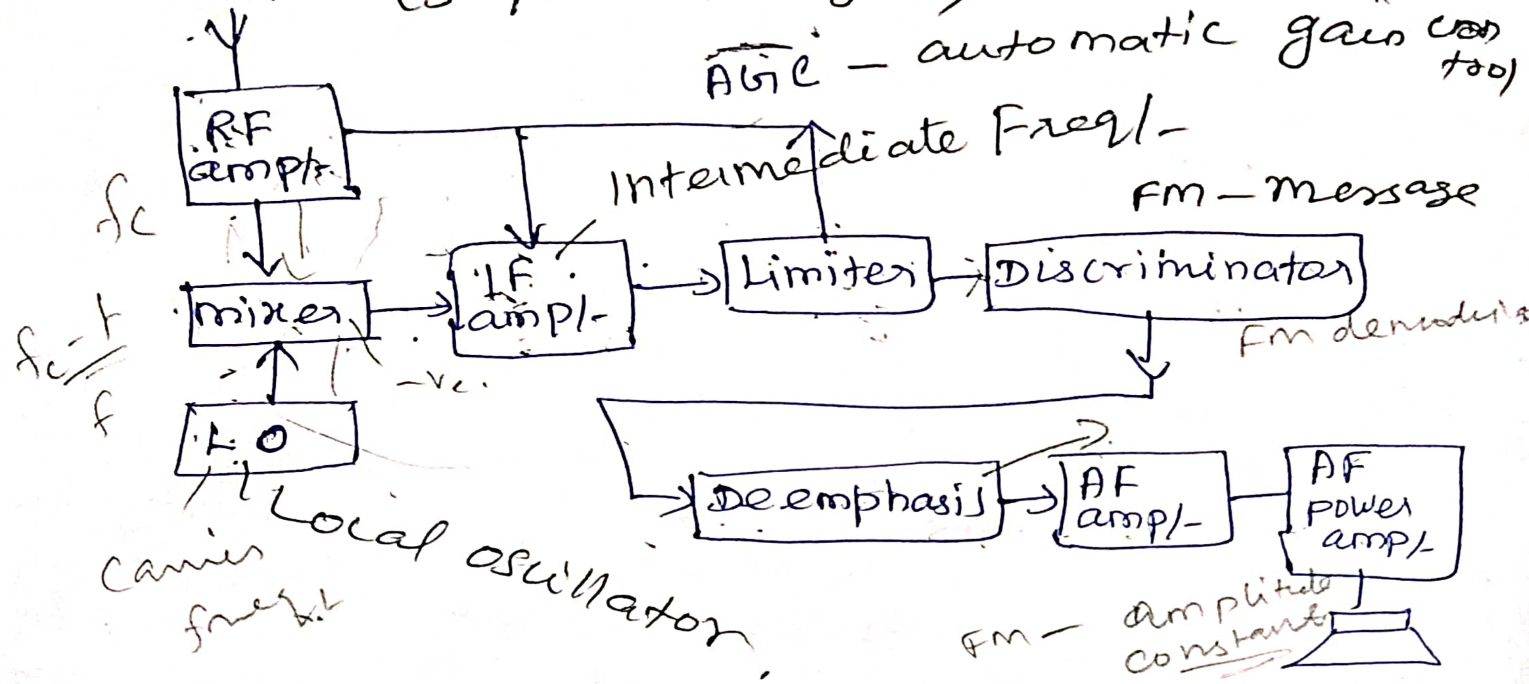
Audio Processing & filtering:

This block filter the external noise from the message signal.

Class A & class B amplifier:

The modulating signal is amplified by to high power level.

FM Receiver: ✓
(superhetrodyne)



RF ampl:
→ It eliminates noise in Rx signal.
→ It improves noise figure.

mixer: Down converts the incoming carrier freq to IF.

LO : LO freq varied such that IF is obtained at mixer.

IF : Provide gain to the signal amplification done in two or more cascade stages.

limiter : remove amplitude variation

AGC : Provides automatic gain ctrl in the Rx. It works along with limiter.

Discriminator: Demodulate Rxed signal

De-emphasis: to reduce noise it is used.

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mixer = $f_c \pm f_o$ = $f_c \mp f_o$ (RF)

f_o – IF, $f_c + f_o$