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Subject:- PCE

Assignment 04.

(Q.1)

Ans (i) Fidelity :- Ability of a communication system to produce an exact replica of the original signal source information at the output of the receiver.

Radio receiver should have high fidelity or accuracy.

(ii) Sensitivity :- Ability to amplify weak signals. Broadcast receivers/radio receivers should have reasonably high sensitivity so that it may have good response to the desired signal.

(iii) Selectivity :- Selectivity of radio receiver is its ability to differentiate desired signal from unwanted signals.

(Q.2)

Ans (i) Image Frequency :-

Generally, local oscillator frequency is equal to the sum of signal frequency and intermediate frequency.

$$f_o = f_s + f_i$$

When f_s and f_o are mixed, the difference frequency is equal to f_i which is the only one passed and amplified by the IF stage.

- Suppose an undesired frequency reaches the mixer. These two frequency components will be now (f_s) & (f_{si}) .
- This IF signal will also have to be amplified by the IF stage and provide interference.
- The term (f_{si}) is called the image frequency and is defined as the signal frequency plus twice the intermediate frequency.
→ $[f_{si} = f_s + 2f_i]$

→ Once an image frequency is down-converted to IF, it cannot be removed. In order to reject the image frequency, it has to be blocked prior to the mixer stage.

(ii) Double spotting:-

- Same station get picked up at two different nearby points, on the receiver dial.
- Due to inadequate image frequency rejection.
- Harmful, since a weak station can be masked by the reception of a strong station at the same point.
- Can be reduced by increasing front end selectivity of the receiver.
- Including the RF amplifier stage helps in avoiding double spotting.

(Q.4)

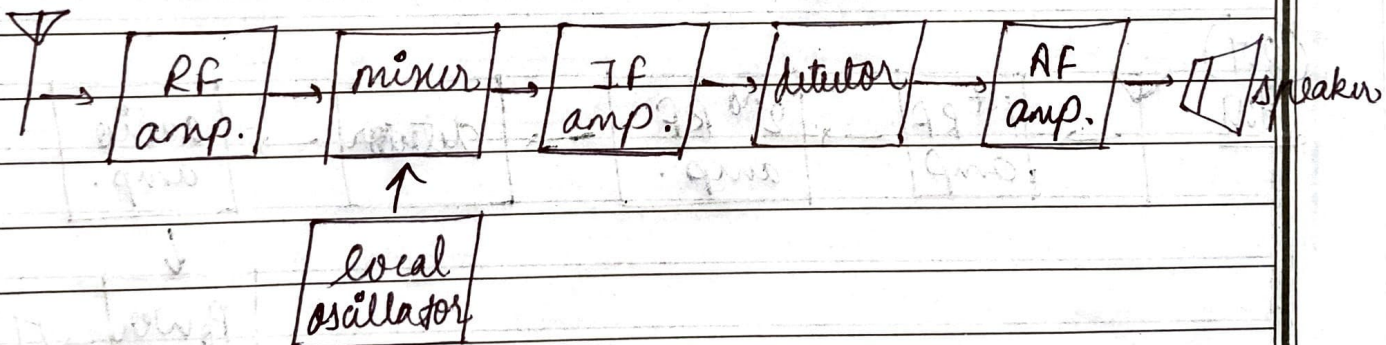
Ans. Choice of IF for AM:-

- (i) High IF :- Better image frequency rejection. Difficult to build stable amplifier.
- (ii) Low IF :- Stability since low frequency is used. Poor image frequency rejection.

(Q.5)

Ans. Disadvantages of Tuned RF receiver:-

- (1) It is very difficult to design at higher frequency.
- (2) → Difficult to design tunable RF stages.
- (3) → Difficult to obtain high gain RF amplifiers.
- (4) → It has poor audio quality.

→ Superhetrodyne Receiver:-

→ Superhetrodyne receiver converts all incoming signals to a lower frequency, known as the intermediate frequency (IF) at which a single set of amplifiers is used to provide a fixed level of selectivity and sensitivity.

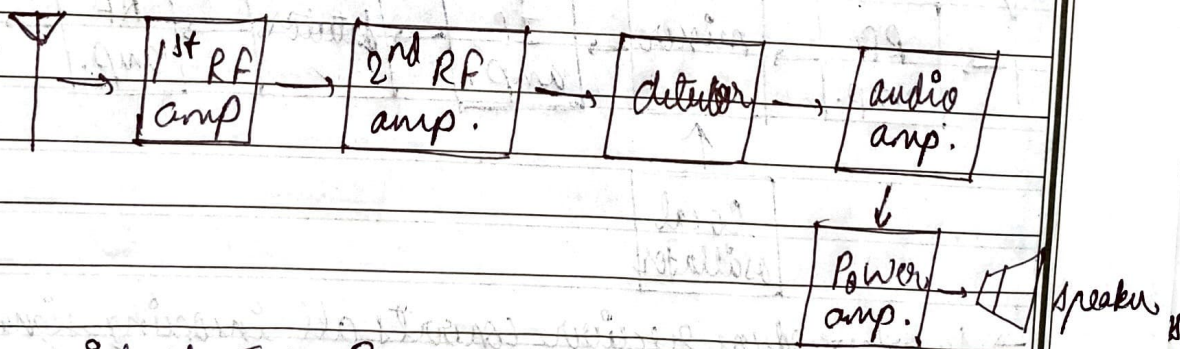
- The key circuit is the mixer - act as a simple amplitude modulator to produce sum and difference frequencies.
- Heterodyne means to mix two frequencies together in a non-linear device or to translate one frequency to another using nonlinear mixing.

(Q.6)

TRF receiver	Superheterodyne receiver
→ No frequency conversion.	→ Frequency Conversion.
→ NO IF frequency.	→ Downconvert RF signal to lower IF frequency.
→ Instability, variation in BW & poor selectivity due to high frequency bandwidth & poor selectivity & IF introduced	→ No instability, variation & poor selectivity & IF introduced
→ Difficult to design tunable RF stages.	→ Main amplification takes place at IF.
→ Rarely used	→ Mostly used.

(Q.7)

Ans



→ It consists of 5 basic components:-

- (1) Antenna or aerial.
- (2) One or more TRF amplifier stages.
- (3) Detector (diode)
- (4) Usually an audio amp.

→ Advantages:-

- (1) TRF receivers are simple to design.
- (2) TRF has high sensitivity.
- (3) Ability to drive the speaker to an acceptable level.

→ Disadvantages:-

- (1) It allows the broadcast frequency 535 KHz to 1640 KHz. But at higher frequency, it produces difficulty in design.
- (2) Problem of instability.
- (3) It has poor audio quality.