

INU PESH

Name : Javid

ID : 13151

Programme : Bs (Telecom)

Subject : Analogy and Digital
Communication .

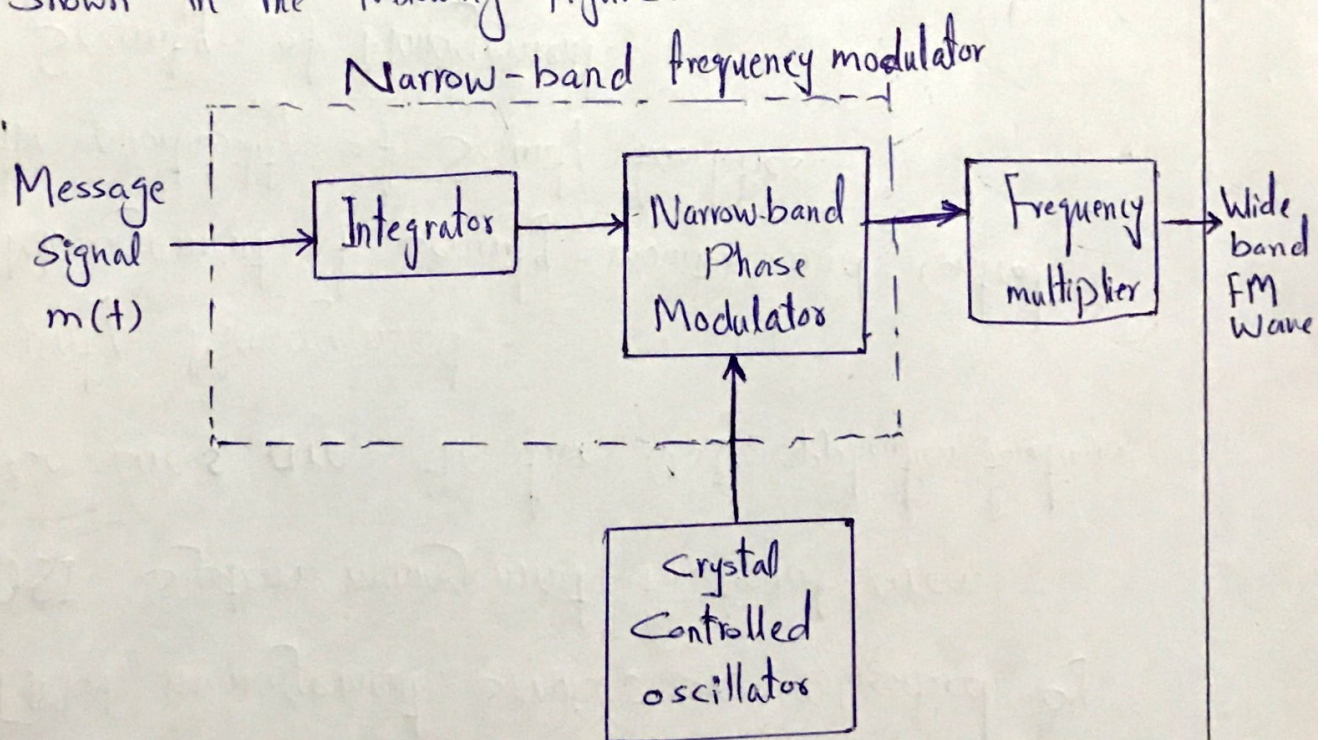
Submitted to : Sir. Daud Khan

Q# 1: Describe the Direct and Indirect method of Generation of Wideband FM Signals?

Answer ~~is~~ Indirect method:

This method is called as Indirect method because we are generating a wide band FM wave indirectly. This means, first we will generate NBFM wave and then with the help of frequency multipliers we will get WBFM wave.

The block diagram of generation of WBFM wave is shown in the following figure.

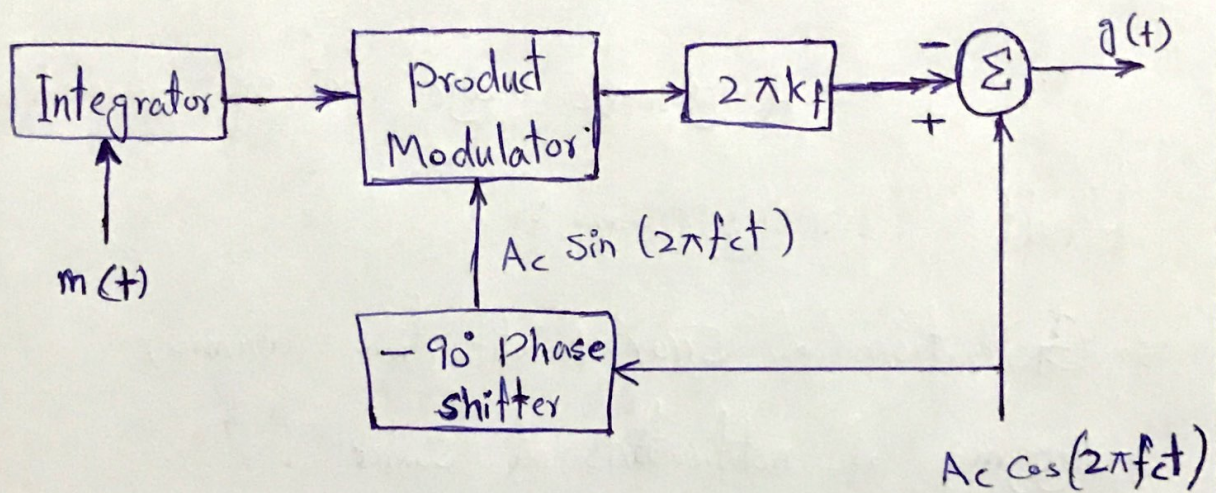


⇒ Direct Method :

This method is called as the Direct Method because we are generating a wide band FM wave directly.

In this method, voltage controlled oscillator (VCO) is used to generate WBFM.

VCO produces an output signal, whose frequency is proportional to the input signal voltage.



Q# 2: Write your understanding about the block diagram given below?

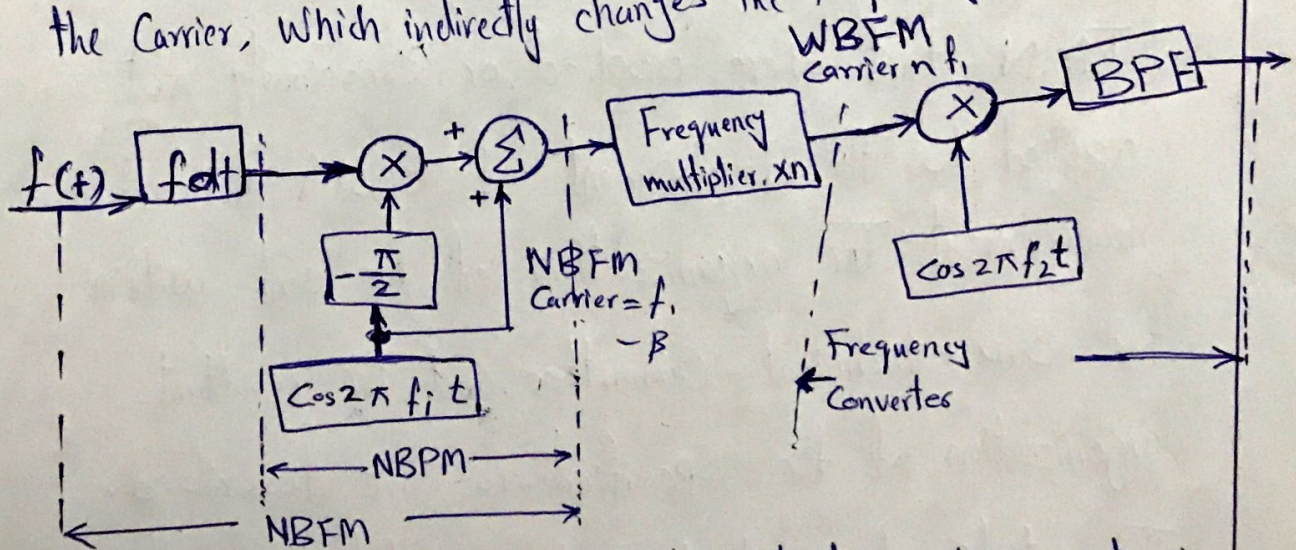
Answer \Rightarrow Armstrong FM Transmitter
Block Diagram:

This balanced modulator is an amplitude modulator used to form an envelope of double side-bands and to suppress the carrier signal (DSB).

This requires two input signals, the carrier signal and the modulating message signal.

\Rightarrow In this method, high frequency stability can be obtained because we can use crystal oscillator.

\Rightarrow Armstrong method of FM generation is the indirect method because the modulating signal directly varies the phase of the carrier, which indirectly changes the frequency.



\Rightarrow The modulation index at the output of the combining network is inadequate to produce a wideband FM and therefore must be multiplied and amplified before transmitting.

⇒ It seen that the output from the combining network is a signal whose phase is varied by f_m and magnitude is directly proportional to the magnitude of U_m .

⇒ A combination of multipliers and mixers are thus placed to develop the desired transmit carrier frequency with 75 kHz frequency deviation

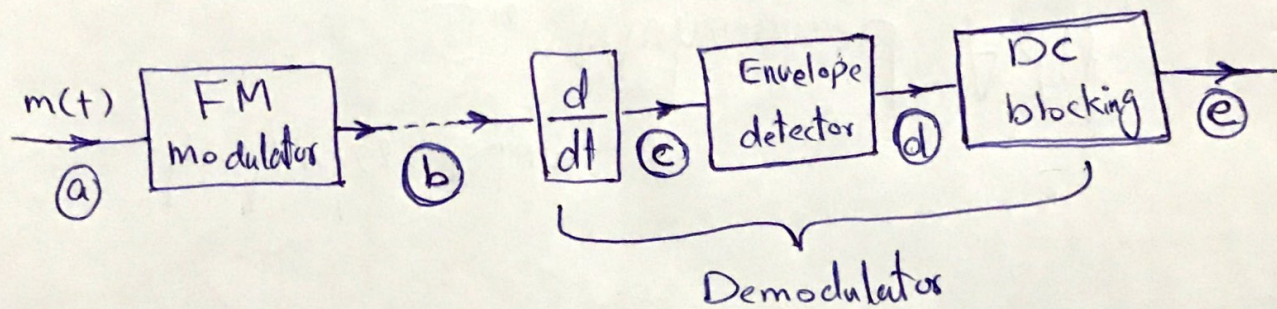
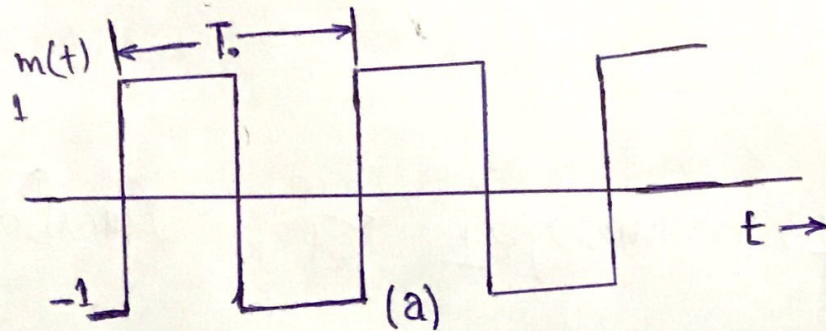
⇒ The outcome of the mixer block is the change in the center frequency, while the outcome of the multiplier block is the multiplication of the center frequency and the frequency deviation equally.

⇒ In the Armstrong method FM generation, the phase of the carrier is directly modulated in the combining network through summation, generating indirect frequency modulation.

⇒ Very high frequency stability is achieved through Armstrong method since the crystal oscillator is used as carrier frequency generator.

Q# 3: A Periodic Square --- $m(t)$ --- $f_c = 10\text{kHz}$ with $\Delta f = 1\text{kHz}$. The Carrier amplitude is A .

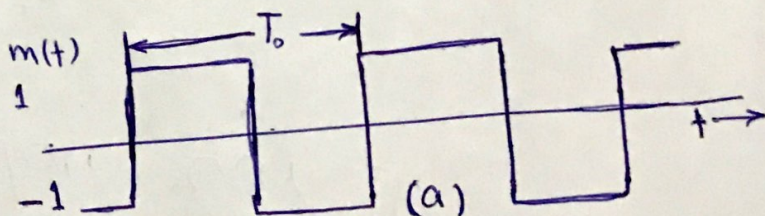
The resulting --- shown in fig. Ps. 4-2b ---
 Sketch the waveforms at Point. b, c, d and e?



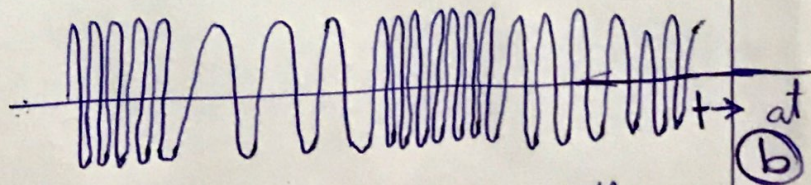
Answer →

Solution :

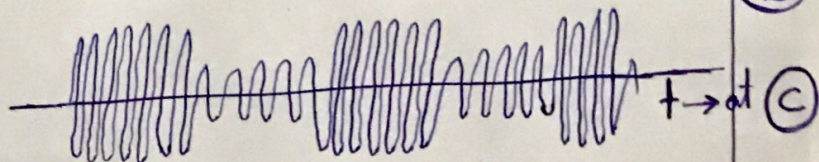
Input Signal $m(t)$



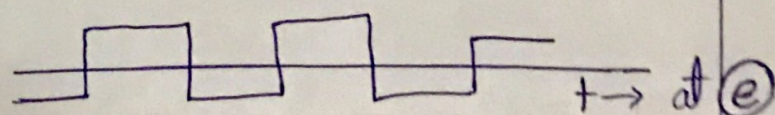
Signal at Point "b"



Signal at Point "c"



Signal at Point "d"



Q# 4. Define Noise and briefly discuss its types in detail.

Answer - Noise : With reference to an electrical system, noise may be defined as any unwanted form of energy which tends to interfere with proper reception and reproduction of wanted signal.

Or Noise is random, undesirable electrical energy that enters the Communications System via the Communicating medium and interferes with the transmitted message. However, some noise is also produced in the receiver.

Types of Noise :

1. Internal Noise :

Due to random movement of electrons in electronic circuit

i.e. noise ~~whose sources are external~~. noise which get generated within the receiver or communication system.

→ Internal noise may be put into four following categories:

- 1. Thermal noise or White noiser
- 2. Shot Noise
- 3. Transit time noise
- 4. Miscellaneous internal Noise

2. External Noise :

Man made noise and natural resources.

i.e. noise whose sources are external.

→ External noise may be classified into the following three types :

- 1. Atmospheric noises
- 2. Extraterrestrial noises
- 3. Man-made noises or industrial noises.

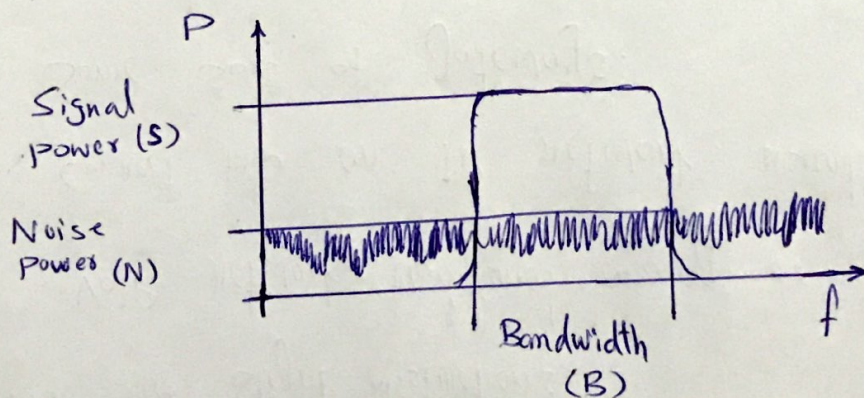
Q# 5: Discuss the following:

1. Noise Power
2. Pulse Code Modulation
3. Sampling.

Answer: 1. Noise Power: In telecommunication, the term noise power has the following meanings:

The measured total noise in a given bandwidth at the input or output of a device when the signal is not present; the integral of noise spectral density over the bandwidth. Interfering and unwanted power in an electrical device or system.

Noise Power



- Most of input noise = Thermal noise
- Noise power $N_p = k_B T B$

k_B = Boltzmann's Constant $1.38 \times 10^{-23} \text{ J/K}$

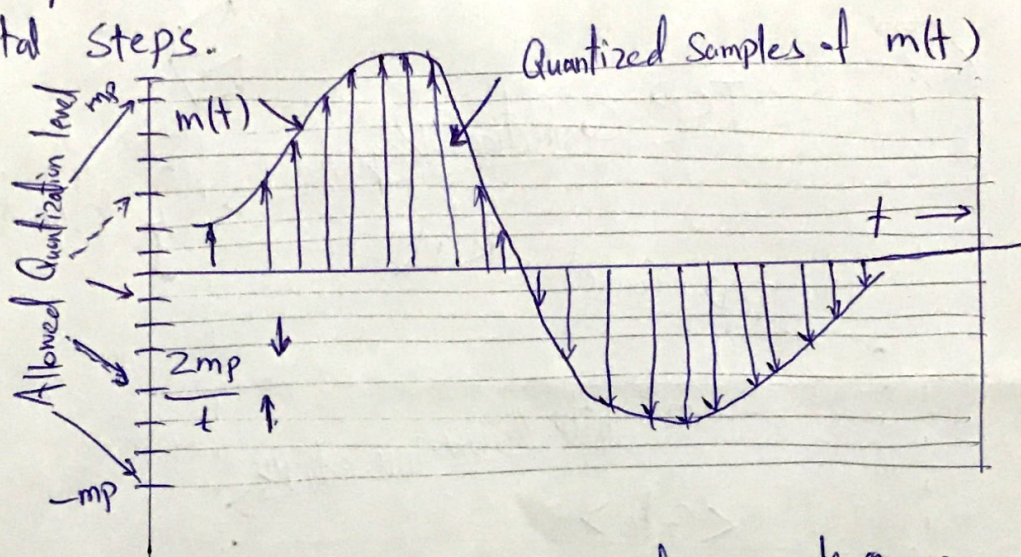
T = Absolute temperature of device

B = Circuit bandwidth

2. ⇒ Pulse Code Modulation:

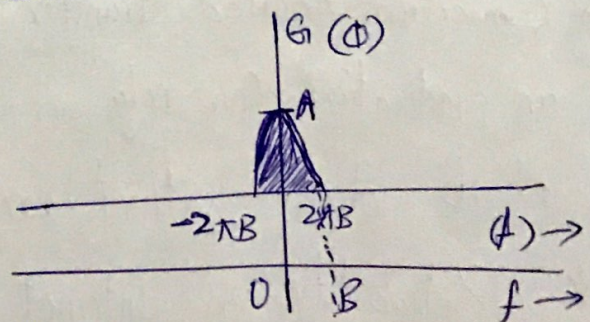
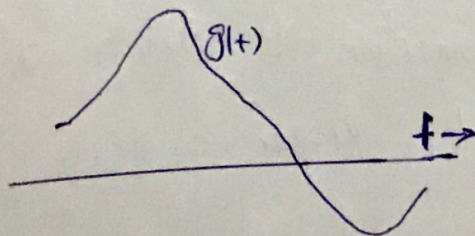
PCM is a method used to digitally represent sampled analog signals.

In PCM stream, the amplitude of the analog signal is sampled regularly at uniform intervals, and each sample is quantized to the nearest value within a range of digital steps.



3. ⇒ Sampling = Is the process of converting a continuous time signal into a discrete time signal by measuring the signal at periodic instants in time.

- Consider a signal $g(t)$ whose spectrum is band-limited to B Hz



- Sampling $g(t)$ in time intervals T_s results in the signal

$$\bar{g}(t) = g(t) \delta_{T_s}(t) = \sum_n g(nT_s) \delta(t - nT_s)$$

with the impulse train $\delta_{T_s}(t)$:

