

UNIT V

ANALOG PULSE MODULATION SCHEMES

1. Define Sampling.

The process of converting continuous time signals into equivalent discrete time signals can be termed as **Sampling**. A certain instant of data is continually sampled in the sampling process.

2. What are the types of Sampling?

Three types of sampling

- Instantaneous Sampling
- Natural Sampling
- Flat-Top Sampling

3. Define Sampling Theorem.

The sampling rate should be such that the data in the message signal should neither be lost nor it should get over-lapped. The **sampling theorem** states that, “a signal can be exactly reproduced if it is sampled at the rate **fs**, which is greater than or equal to twice the maximum frequency of the given signal **W**.”

Mathematically, we can write it as

$$f_s \geq 2W$$

4. Define Nyquist rate.

If the sampling rate is equal to twice the maximum frequency of the given signal **W**, then it is called as **Nyquist rate**.

5. Define Sampling rate.

To discretize the signals, the gap between the samples should be fixed. That gap can be termed as the sampling period **Ts**. Reciprocal of the sampling period is known as **sampling frequency** or **sampling rate fs**.

Mathematically, we can write it as

$$f_s = 1/T_s$$

6. Define Aliasing.

We can observe from the waveform that there is over-lapping of information, which leads to mixing up and loss of information. This unwanted phenomenon of over-lapping is called as **Aliasing**.

7. What are the types of Pulse modulation techniques?

- Pulse Amplitude Modulation
- Pulse Width Modulation
- Pulse Position Modulation

8. Define pulse amplitude Modulation.

In **Pulse Amplitude Modulation (PAM)** technique, the amplitude of the pulse carrier varies, which is proportional to the instantaneous amplitude of the message signal.

9. Define pulse width Modulation.

In **Pulse Width Modulation (PWM)** or Pulse Duration Modulation (PDM) or Pulse Time Modulation (PTM) technique, the width or the duration or the time of the pulse carrier varies, which is proportional to the instantaneous amplitude of the message signal.

10. Define pulse position Modulation.

Pulse Position Modulation (PPM) is an analog modulation scheme in which, the amplitude and the width of the pulses are kept constant, while the position of each pulse, with reference to the position of a reference pulse varies according to the instantaneous sampled value of the message signal.

11. What are the types of PAMs?

Two types of PAMs

- Single Polarity PAM
- Double Polarity PAM

12. What is the Advantage of PAM system?

In PAM, amplitudes of regularly spaced pulses are varied in proportion to corresponding sample values of continuous message signal. Hence system is lowest in complexity to implement. Hence generation and detection is easy.

13. What are the Advantages of PWM system?

- Noise interference is less or minimum.
- System is moderate in complexity to implement.
- It has moderate power efficiency among all three types.
- It supports higher power handling capability.

14. What are the Advantages of PPM system?

- Noise interference is less or minimum due to constant amplitude.
- It is easy to separate out signal from noisy signal.
- It has highest power efficiency among all three types.
- Instantaneous power of PPM modulated signal remains constant due to constant pulse widths and pulse amplitudes.
- It requires less power compare to PAM due to short duration pulses.

15. How to generate PWM wave?

Two types of PWM generation methods

- Generation of PWM using Comparator
- Generation of PWM using Monostable Multivibrator Circuit.

16. Draw PAM generation and Detector block diagrams.

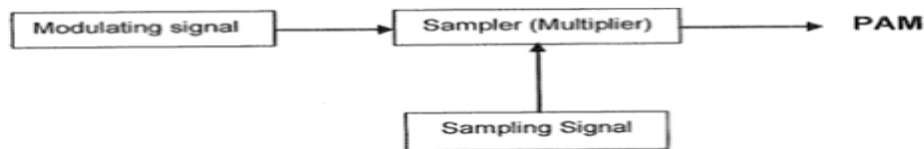


Fig1. Generation of PAM signal

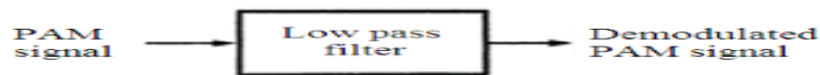


Fig3. PAM detector

17. What are the Types of Pulse Time Modulations?

Two types are there

- Pulse Width Modulation
- Pulse Position Modulation

18. What are the Drawbacks of PAM?

- Noise interference is higher.
- It is difficult to remove noise, as this will affect amplitude part which carries information.
- It has lowest power efficiency among all three types.
- Instantaneous power of transmitter varies.
- Transmission bandwidth is too large.

19. Define Multiplexing.

Multiplexing is the process of combining multiple signals into one signal, over a shared medium. If the analog signals are multiplexed, then it is called as analog multiplexing. Similarly, if the digital signals are multiplexed, then it is called as digital multiplexing.

20. What are the Types of Multiplexing?

Two types of multiplexing

1. Time Division Multiplexing(TDM)
2. Frequency Division Multiplexing(FDM)