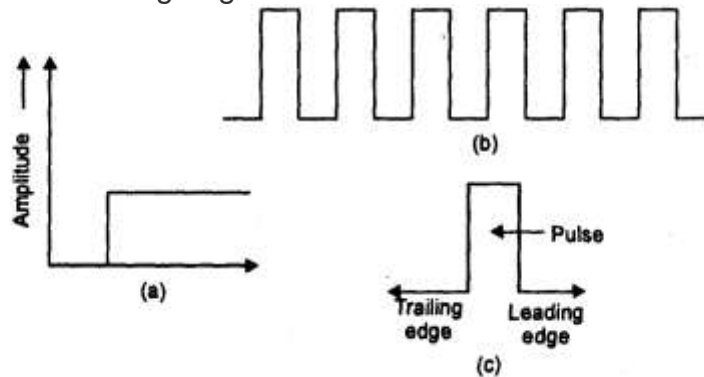


. 1. What is a pulse?

Ans. Pulse : A pulse is an abruptly changing voltage or current wave which may or may not repeat itself. The Figure (b) Shows a repetitive pulse train and Figure (c) shows a pulse with its trailing and leading edge.



Q. 2. Define pulse modulation.

Ans. Pulse modulation : It may be defined as a modulation system in which some parameter of a train of pulse is varied in accordance with the instantaneous value of the modulating signal.

In this system, waveforms are sampled at regular intervals and the information is transmitted through the sampling rate.

The parameters of the pulses which may be varied are : amplitude, width (or duration), position and time etc.

Q. 3. Write a note on pulse modulation communication system.

Ans. Introduction The AM, FM and PM systems are called CW (continuous wave) modulation systems, in which some parameter (amplitude, frequency, phase) of a continuous high frequency carrier wave is varied in accordance to the modulating signal. But in pulse modulation systems, instead of a continuous wave, a train of pulse is employed and some parameter of the pulse is varied in accordance with the instantaneous value of the modulating signal.

Key advantages

1. The pulses are quite short as compared to the time in between, so a pulse modulated wave remains off most of the time.
2. The time interval between the pulses may be filled with sample values from other messages, so we can send many messages at a time on a pulse communication system.
3. One of the chief advantages of pulse modulation is that if we combine pulse modulation with continuous modulation (AM, FM, PM), we can obtain "multi channel" communication system, a desirable feature for "data transmission".

Comparison Digital Pulse System with Analog Systems

(a) The following are the advantages of digital Pulse transmission over the analog transmission.

1. In digital system, message security can be improved.
2. The digital communication system having more noise immunity and external interference rejection capabilities.
3. In digital communication system, the information (or intelligence) which is in digital form can be easily stored where as in analog signal cannot.
4. Digital communication system are more flexible in operation than analog communication system.

(b) The disadvantages of the digital (pulse) communication system or digital transmission are as follows:

1. The transmission (channel) band width required by the digital communication system is much more than the analog communication system.
2. The digital communication systems are more complex than the analog commutation systems.
3. A precise time synchronization is required between transmitter and receiver in Digital system transmission.

Q.What are various pulse modulation techniques. Compare them.

Ans. There are 3 pulse modulation techniques:

- (1) Pulse amplitude modulation (PAM)
- (2) Pulse width modulation (PWM)
- (3) Pulse Position modulation

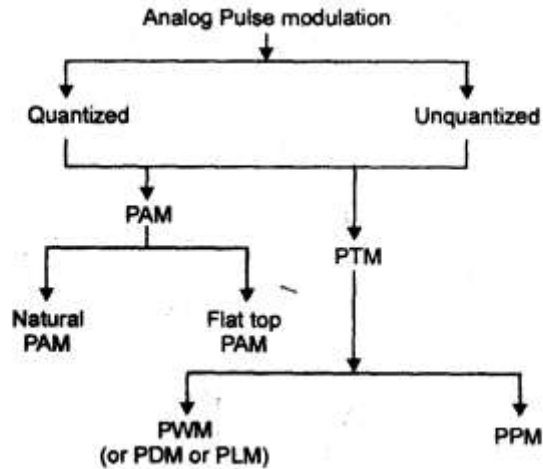
Table 1.

S. No.	PAM	PWM (or PDM, PLM)	PPM
1.	Amplitude of the carrier pulse is proportional to the amplitude of the modulating signal.	The width (or duration or length) of the carrier pulse is proportional to the amplitude of the modulating signal.	The relative position of the carrier pulse is proportional to the amplitude of the modulating signal.
2.	The B.W. of the transmitting channel depends upon the width of the pulse.	The B.W. of the channel depends upon rise time of the pulse $B.W. = \frac{1}{2} t$ where t is the rise time.	The B.W. of the channel depends upon the rise time of the pulse $B.W. = \frac{1}{2} t.$
3.	The instantaneous power of the transmitter varies.	The instantaneous power of the transmitter varies.	The instantaneous power of the transmitter remains constant.
4.	Noise interference is high.	Noise interference is low.	Noise interference is low.
5.	Similar to amplitude modulation (AM).	Similar to frequency modulation (FM).	Similar to phase modulation (PM).

Q. 7. Classify analog pulse modulation systems.

Ans. (a) In general we can subdivide pulse modulation into

- (i) Quantized modulation.
- (ii) Unquantized modulation.



Q. Describe PAM along with its types.

Ans.

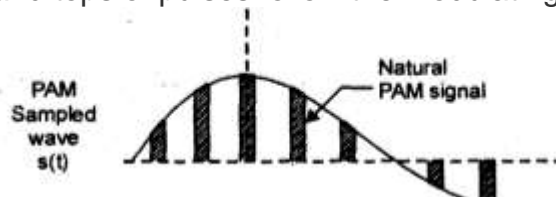
Definition

(a) The PAM (Pulse amplitude modulation) is a modulation mode, in which amplitude of the carrier pulse train is varied according to the modulating signal.

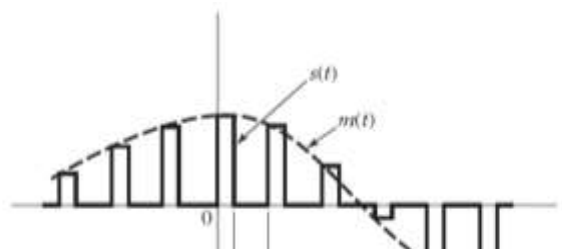
Types of PAM :

There are two types of PAM:

1. **Natural PAM:** Natural PAM sampling occurs when finite width pulses are used in the modulation and tops of pulses follow the modulating signal.



2. **Flat top PAM :** In this, method , the pulses obtained are flat. The pulses have a constant amplitude within the pulse interval. It can easily be achieved by a sample and hold circuit



The flat top PAM is most popular and widely used, because during transmission the noise interferes with the top of the pulses. This noise can be removed easily if pulses have a flat top.

Classification of PAM

- (i) Dual polarity PAM
- (ii) Single polarity PAM,



advantages of PAM:

Main advantages of PAM are simple transmitter and receiver designs. PAM is used to carry information as well as to generate other pulse modulations

Disadvantages of PAM:

Following are the disadvantages of pulse amplitude modulation.

- (1) The BW required for transmission of a PAM signal is very large as compared to the maximum frequency present in the modulating signal.
- (ii) As the amplitude of the carrier pulses is varied according to the amplitude of the modulating signal, noise is maximum in the PAM wave.
- (iii) As the amplitude of the PAM signal is varied, this also varies peak power required by the transmitter.

Q. Discuss pulse time modulation (PTM).

Ans. Definition

In PTM amplitude of the pulse is kept constant, whereas width or position of the pulse is made proportional to the amplitude of the message signal

The PTM has two types:

- 1. **Pulse width modulation (PWM)**
- 2. **Pulse position modulation (PPM)**

Pulse width modulation

In pulse width modulation (PWM), the width of the carrier pulse is varied according to the instantaneous value of the modulating signal, while the amplitude remains constant.

This system is also called "Pulse duration modulation" (PDM) or "Pulse length modulation" (PLM).

Advantages of PWM:

- (i) Noise is less in PWM as the amplitude is kept constant. Note that PAM is noisy.
- (ii) The signal and noise separation is easy.
- (iii) The PWM does not require synchronization between transmitter and receiver.

Disadvantages:

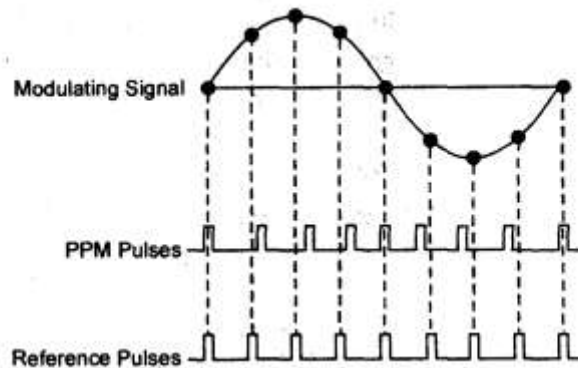
- (i) Large BW is required for PWM communication as compared to PAM.
 - (ii) The transmitter should be able to handle more power (equal to the power of the maximum width pulse).
-

Explain PPM.

Ans.

Pulse position modulation (PPM) :

In this system, amplitude and width of the carrier pulses are kept constant while position of each pulse with respect to the Position of a reference pulse is varied in accordance to the message signal



For this method transmitter and receiver needs to be synchronized

Advantages of PPM:

(1) As the amplitude and width is kept constant, the transmitter handles constant power.

As amplitude is constant, It is less noisy.

The signal and noise separation is easy.

Due to constant pulse width and amplitude the transmitted power for each pulse is same.

Disadvantages

(i) It needs synchronization between transmitter and receiver.

(ii) Large B.W. is required as compared to PAM.