# Digital modulation techniques

Modulation is defined as the process by which some characteristics of a carrier is varied in accordance with a modulating wave. In digital communications, the modulating wave consists of binary data or an M-ary encoded version of it and the carrier is sinusoidal wave.

Different Shift keying methods that are used in digital modulation techniques are

> ➤ **Amplitude shift keying [ASK]**
>
> ➤ **Frequency shift keying [FSK]**
>
> ➤ **Phase shift keying [PSK]**

Fig shows different modulations
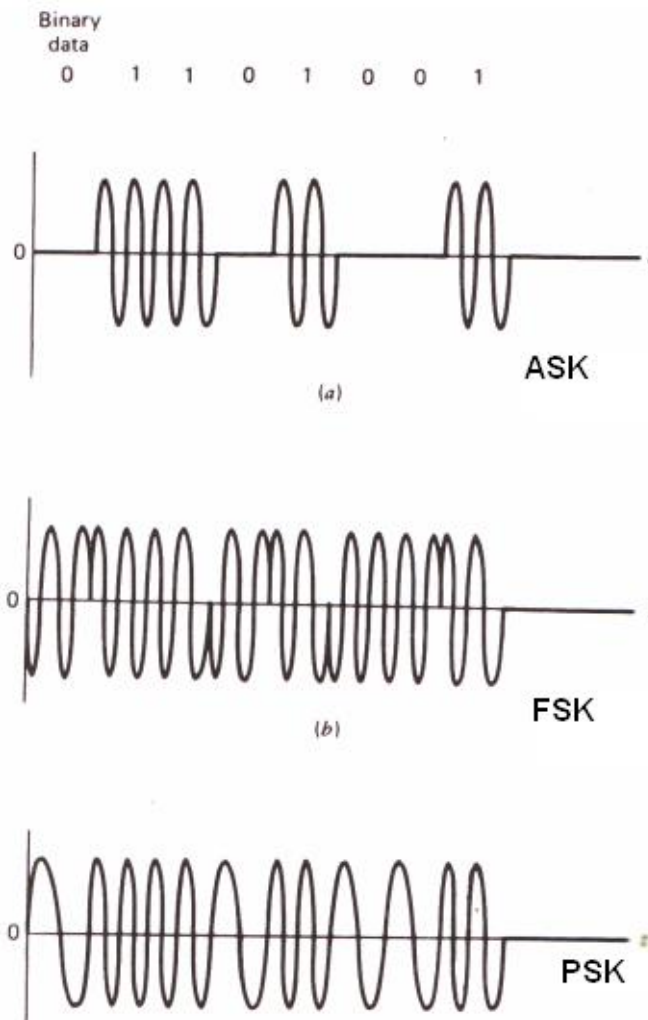
1. ASK[Amplitude Shift Keying]:

In a binary ASK system symbol '1' and '0' are transmitted as

$$S_1(t) = \sqrt{\frac{2E_b}{T_b}} \; Cos2ff_1t \quad \text{for symbol 1}$$

$$S_2(t) = 0 \quad \text{for symbol 0}$$

2. FSK[Frequency Shift Keying]:

In a binary FSK system symbol '1' and '0' are transmitted as

$$S_1(t) = \sqrt{\frac{2E_b}{T_b}} \; Cos2ff_1t \quad \text{for symbol 1}$$

$$S_2(t) = \sqrt{\frac{2E_b}{T_b}} \; Cos2ff_2t \quad \text{for symbol 0}$$

3. PSK[Phase Shift Keying]:

In a binary PSK system the pair of signals $S_1(t)$ and $S_2(t)$ are used to represent binary symbol '1' and '0' respectively.

$$S_1(t) = \sqrt{\frac{2E_b}{T_b}} \; Cos2ff_ct \qquad \text{---------} \qquad \text{for Symbol '1'}$$

$$S_2(t) = \sqrt{\frac{2E_b}{T_b}} \; Cos(2ff_ct + f) = -\sqrt{\frac{2E_b}{T_b}} \; Cos2ff_ct \; \text{------- for Symbol '0'}$$

Hierarchy of digital modulation technique