3.2 PHASE SHIFT KEYING

Phase-shift keying (PSK) is a digital modulation process which conveys data by changing (modulating) the phase of a constant frequency reference signal (the carrier wave). The modulation is accomplished by varying the sine and cosine inputs at a precise time. ... Usually, each phase encodes an equal number of bits. The three primary digital modulation types - **PSK, frequency-shift keying (FSK) and amplitude-shift keying (ASK)** - modify base signals for data communication. PSK conveys data by modifying the phase of a signal. ... Binary Phase-Shift Keying (BPSK): Simplest PSK type. Uses two phases separated by 180 degrees.

FREQUENCY SHIFT KEYING (FSK) , MINIMUM SHIFT KEYING (MSK)

Minimum Shift Keying (MSK) : The minimum frequency space that allows the 2 fsk representing symbols 0s and 1s. Thus CP (Continuous Phase) FSK signal with a deviation ratio if one half is defined as MSK.

Frequency Shift Keying (FSK) : Frequency Shift Keying is the as changing amplitude of the carrier signal with respect to the binary information or digital signal.

The advantages of Minimum Shift Keying :

MSK baseband waveform are smoother compared with QPSK MSK signals have continuous phase It does not have any amplitude variation

Frequency Shift Keying (FSK)

Transmitter

The 'N' successive bits are presented in parallel to digital to analog converter. These 'N' bits forms a symbol at the output of digital to analog converter. There will be total 2^N = M possible symbols. The symbol is presented every T_s = N T_b period. The output o digital to analog converter is given to a frequency modulator. Thus depending upon the value of symbol, the frequency modulator generates the output frequency. For every symbol, the frequency modulator produces different frequency output. This particular frequency signal remains at the output or one symbol duration. Thus for 'M' symbols, there are 'M' frequency signals at the output of modulator. Thus the transmitted requencies are f_0, f_1, f_2,……. F_{M-1}, depending upon the input symbol to the modulator.

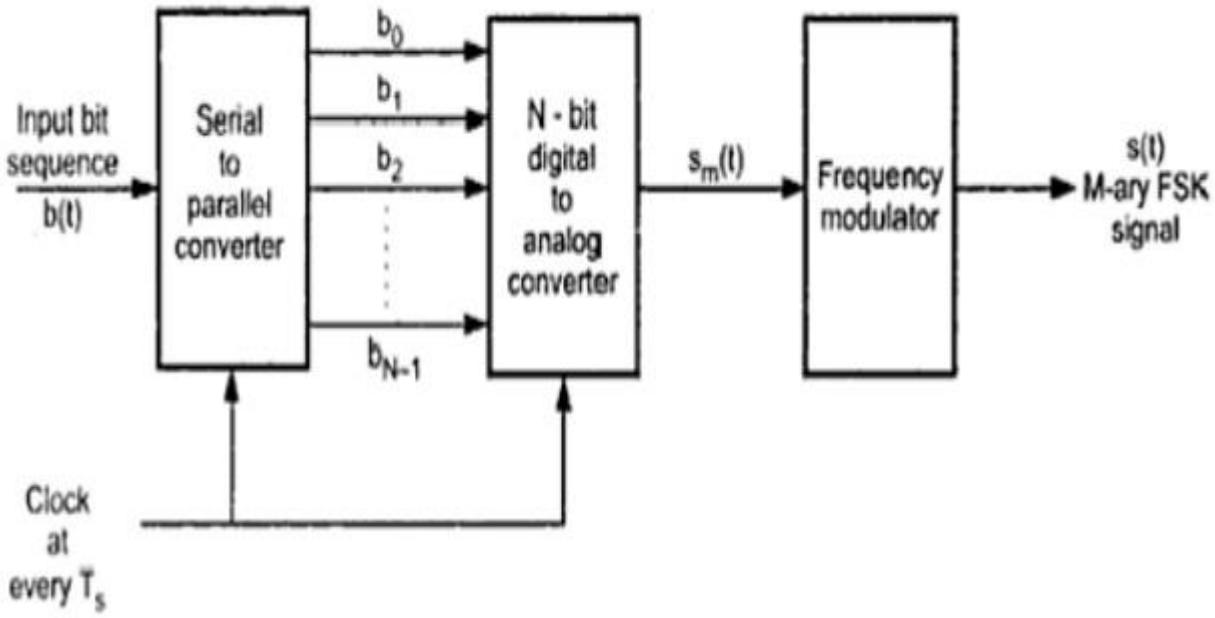

Figure 3.2.1 FSK Transmitter

Receiver

The M-ary PSM signal is given to the set of 'M' bandpass filters. The center frequencies of those filters are f_0, f_1, f_2,……. F_{M-1},. These filters pass their particular frequency and alternate others. The envelope detectors outputs are applied to a decision device. The decision device produces its output depending upon the highest input. Depending upon the particular symbol, only one envelope detector will have higher output. The outputs of other detectors will be very low. The output of the decision device is given to 'N' bit symbol in parallel. These bits are then converted to serial bit stream by parallel to serial converter. In some cases the bits appear in parallel. Then there is no use serial to parallel and parallel to serial converters.

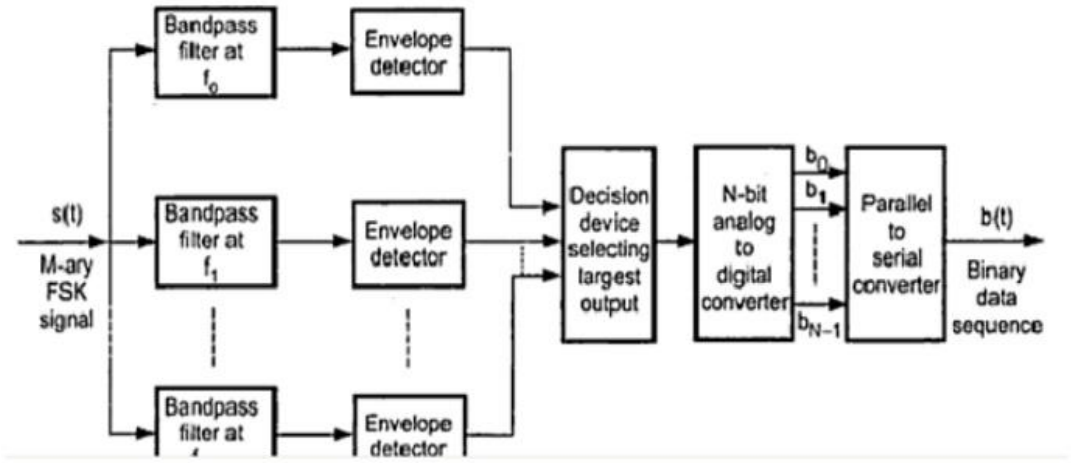

Figure 3.2.2 FSK Receiver

AMPLITUDE SHIFT KEYING (ASK) PHASE SHIFT KEYING (PSK):

Amplitude Shift Keying (ASK) : Amplitude Shift Keying is the as changing amplitude of the carrier signal with respect to the binary information or digital signal.

Define Phase Shift Keying (PSK): Phase Shift Keying is the changing amplitude of the carrier signal with respect to the binary information or digital signal

Concept Of Amplitude Shift Keying In Detail:

The amplitude shit keying is also called on-off keying(OOK). This is the simplest digital modulation technique. The binary input data is converted to unipolar NRZ signal. A product modulator takes this NRZ signal and carrier signal. The output of the product modulator is the ASK signal, which can be expressed mathematically as,

$$v(t) = d \sin(2\pi f_c t) \quad \ldots (2.3.1)$$

Here f_c is the carrier frequency
and d is the data bit, which is either 1 or 0.
Fig. 2.3.1 (a) shows the block diagram of the ASK modulator. The binary data sequence 'd' is given to the NRZ level encoder. This NRZ level encoder converts the input binary sequence to the signal suitable for product modulator. The product modulator also accepts a sinusoidal carrier of frequency f_c. The output o the product modulator is passed through a bandpass filter for bandwidth limiting. The output of the bandpass filter is the ASK signal. This signal and other waveforms are shown in Fig. 2.3.1(b). Observe that the ASK signal. And when d=1, d=$\sin(2\pi f_c t)$. The ASK is very sensitive to noise. It is used for very low bit rates less than around 100 bps. The only advantage of ASK is that it is very simple to implement.

Baud rate

Or ASK, the ASK waveform is changed at the bit rate. Hence Baud rate is given as,

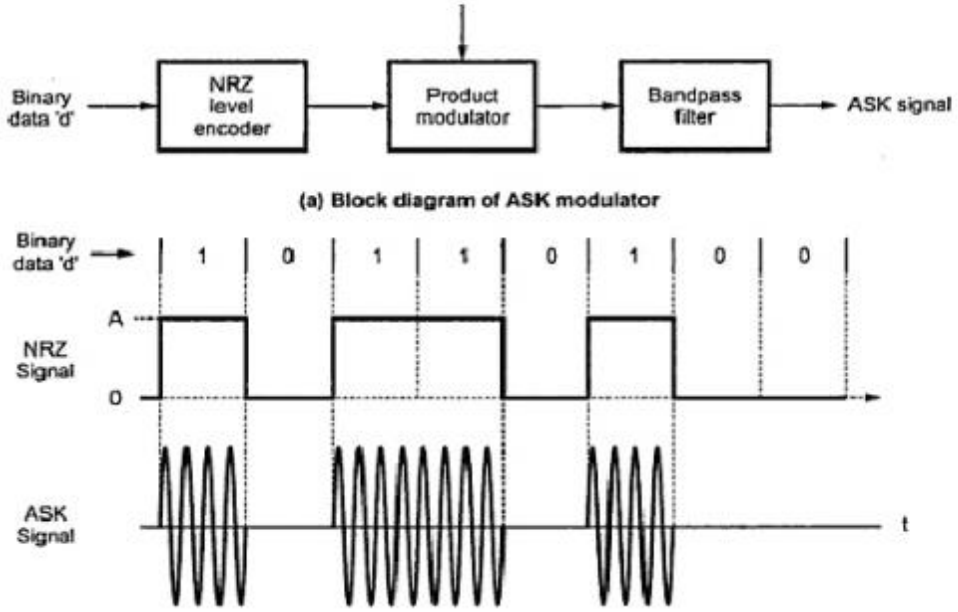

Figure 3.2.3 Amplitude Shift Keying