



SNS COLLEGE OF TECHNOLOGY
An Autonomous Institution
Coimbatore-35



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECB301-ANALOG AND DIGITAL COMMUNICATION

III YEAR/ V SEMESTER

UNIT 4 – DIGITAL MODULATION TECHNIQUES

TOPIC – ASK



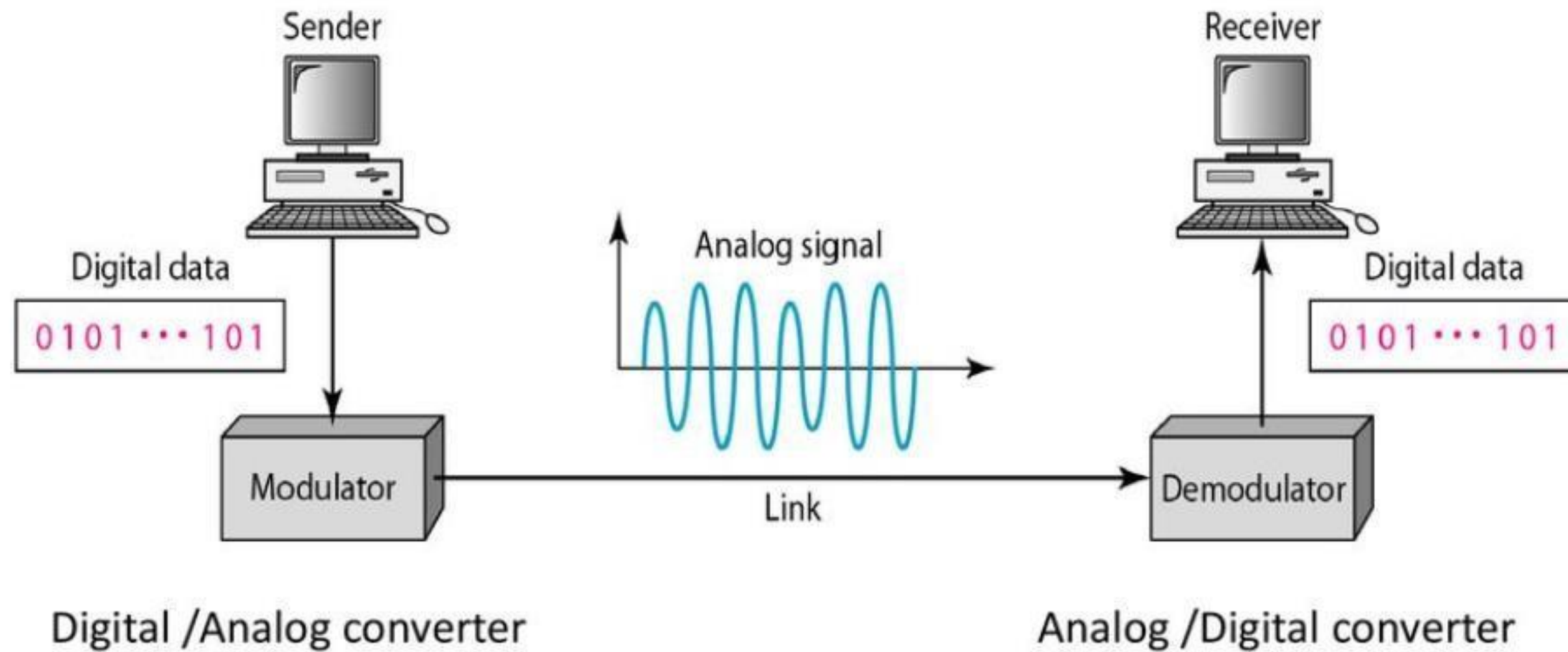
WHY WE NEED THE DIGITAL MODULATION?

- Digital modulation is required if digital data has to be transmitted over a medium that only allows analog transmission (modems in wired networks).
- Digital signals, i.e. 0/1, can be sent over wires using voltages.
- Wireless must use analogue sine waves.

- **This translation is performed by digital modulation:**
 - Digital data is translated into an analog signal (baseband).
 - Shift Keying is the translation process.
 - Amplitude, Freq., Phase Shift Keying (ASK/FSK/PSK).



MODULATION OF DIGITAL DATA





ASPECTS OF DIGITAL TO ANALOG CONVERSION

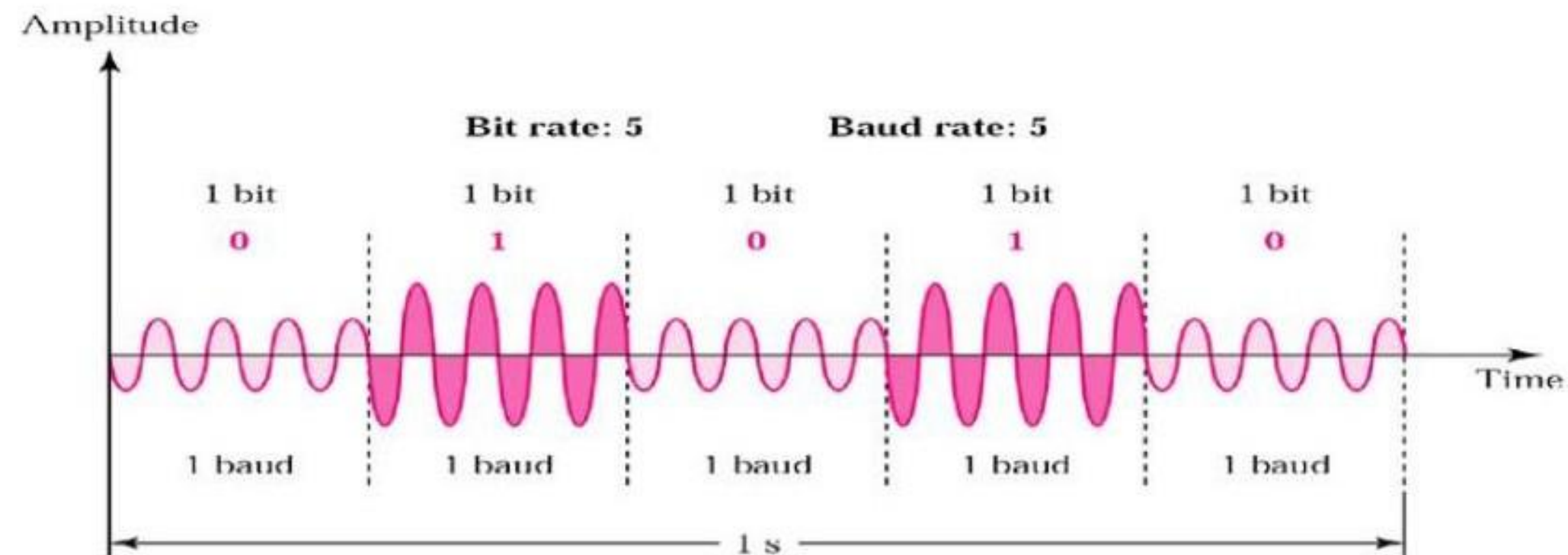


- **Carrier Signal or carrier frequency:**
 - A high frequency signal that acts as a basis for the information signal.
 - Digital information then modulates the carrier signal by modifying one or more of its characteristics (Amplitude, frequency or phase).
 - This kind of modification is called modulation or shift keying, and the information signal is called **modulated signal**.



BIT RATE AND BAUD RATE

- **Bit rate:** is the number of bits per second (bps).
- **Baud rate (Nbaud):** is the number of signal units per second (baud/s).



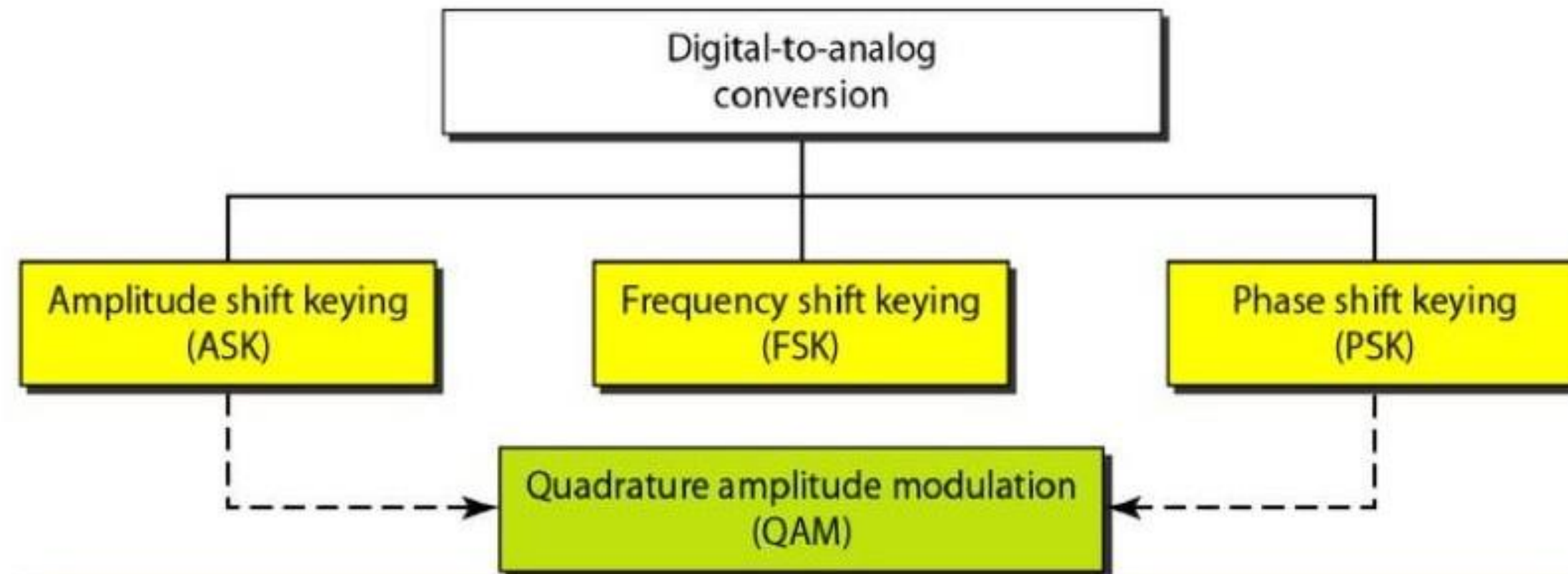
A signal unit (one baud) is composed of 1 or more bits



TYPES OF DIGITAL TO ANALOG CONVERSION



- A sine wave is represented by three characteristics: Amplitude, Frequency and Phase.
- We can change one of these characteristics to represent digital data.



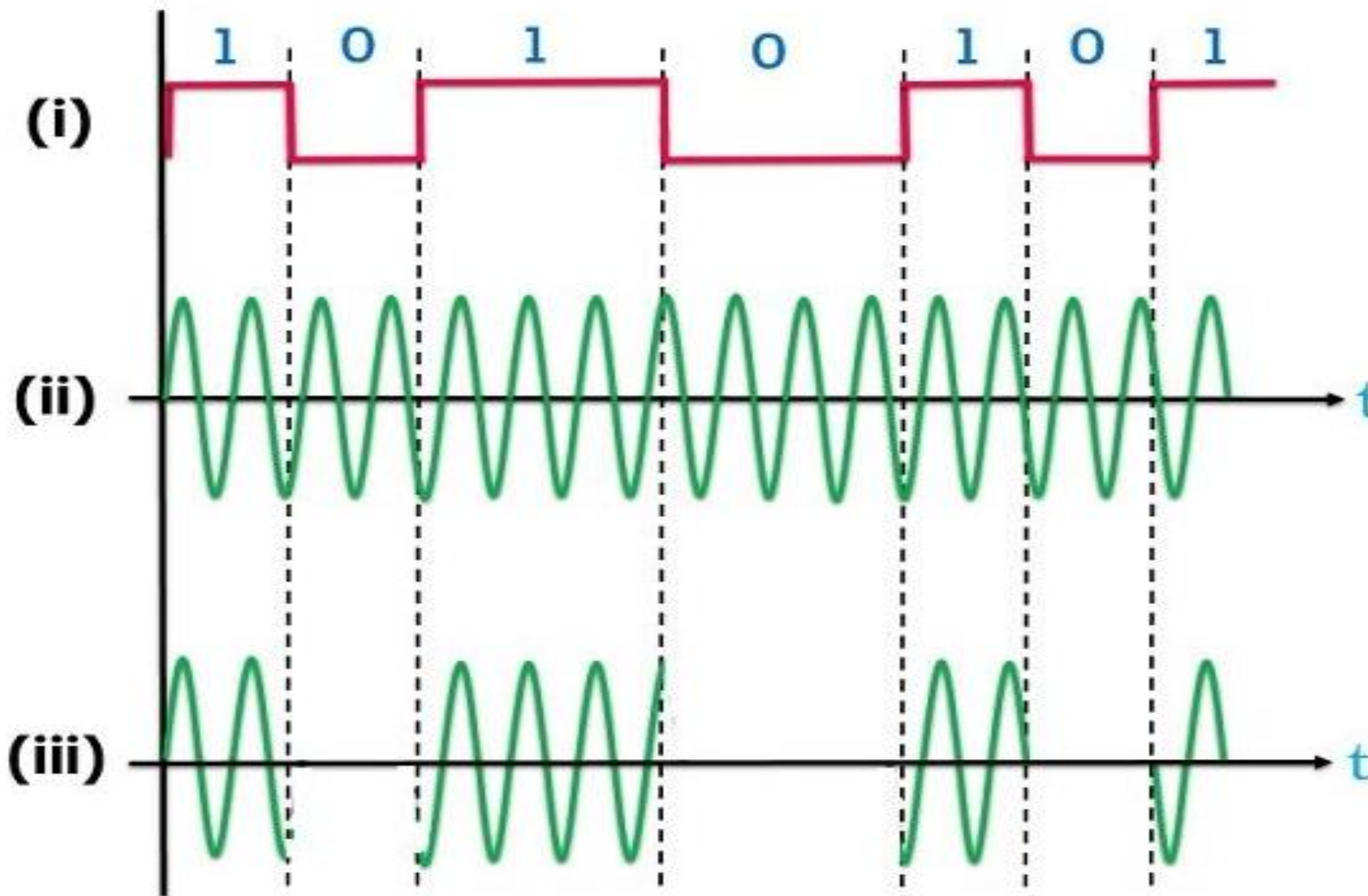


AMPLITUDE SHIFT KEYING

- A digital modulation technique in which the amplitude of the carrier wave is altered according to the modulating signal (bitstream) is known as **Amplitude Shift Keying (ASK)**.
- ASK is sometimes known as **On-Off keying** because the carrier wave swings between 0 and 1 according to the low and high level of input signal respectively.
- In ASK, frequency and phase of the carrier wave is kept constant and only the amplitude is varied according to the digitized modulating signal.
- It is also referred as Binary Amplitude Shift Keying (BASK) as its usual operation is associated with only two levels. However, one can have multiple levels of signal elements also.



WAVEFORM



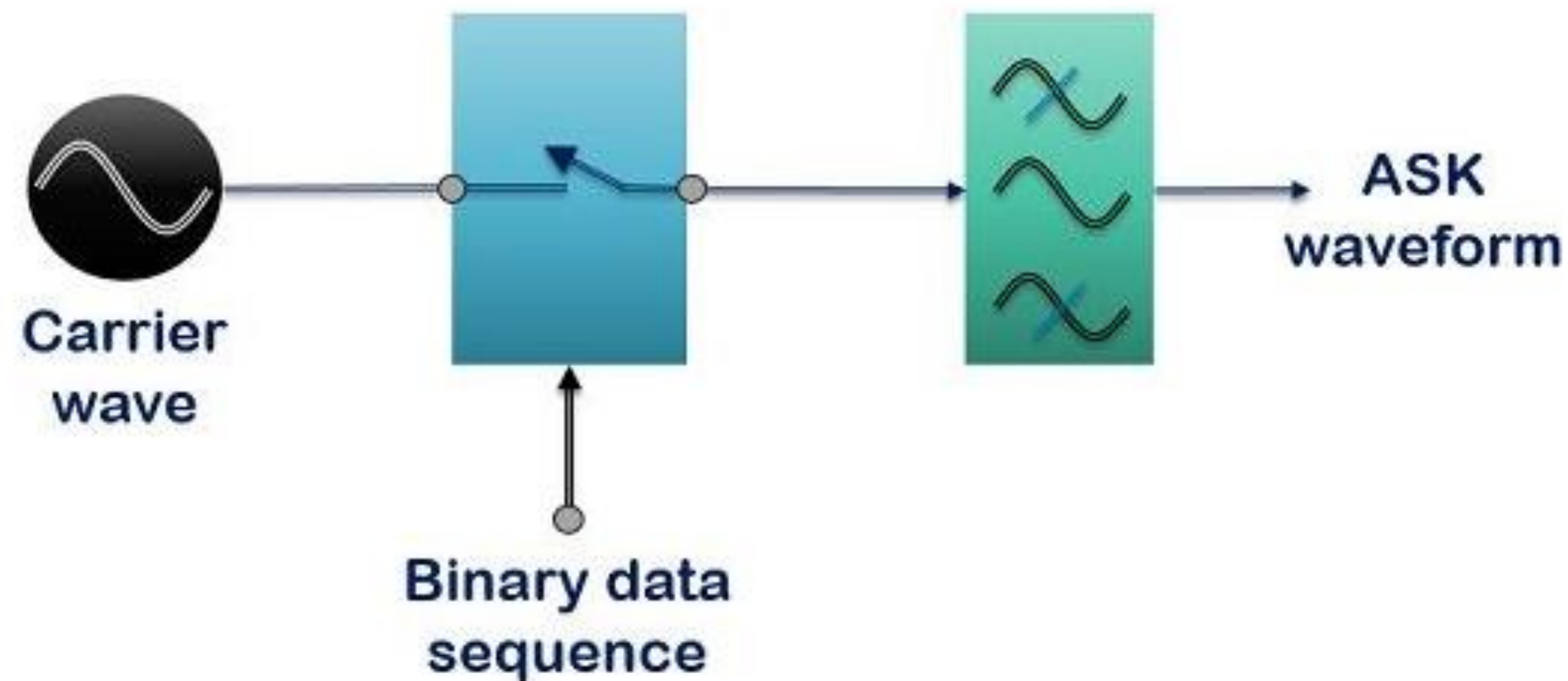
- (i) = Digital bit sequence
- (ii) = Carrier wave
- (iii) = ASK modulated wave



GENERATION OF ASK SIGNAL



- It consists of a signal generator that produces a high-frequency sinusoidal waveform, a message signal in digitized form and a bandpass filter.





- The switch provided here gets open and closed according to the bits of the message signal.
- When the digital bit is of level high i.e., 1 then the switch gets closed. Thus, allows the carrier wave to get transmitted.
- As against, in case of low-level bit i.e., 0 the switch gets open and restrict the carrier wave.
- This is the reason why the signal appears at the output in case of a high level.
- After this, pulse reshaping is done by the band limiting filter according to the amplitude and phase characteristics of the filter.

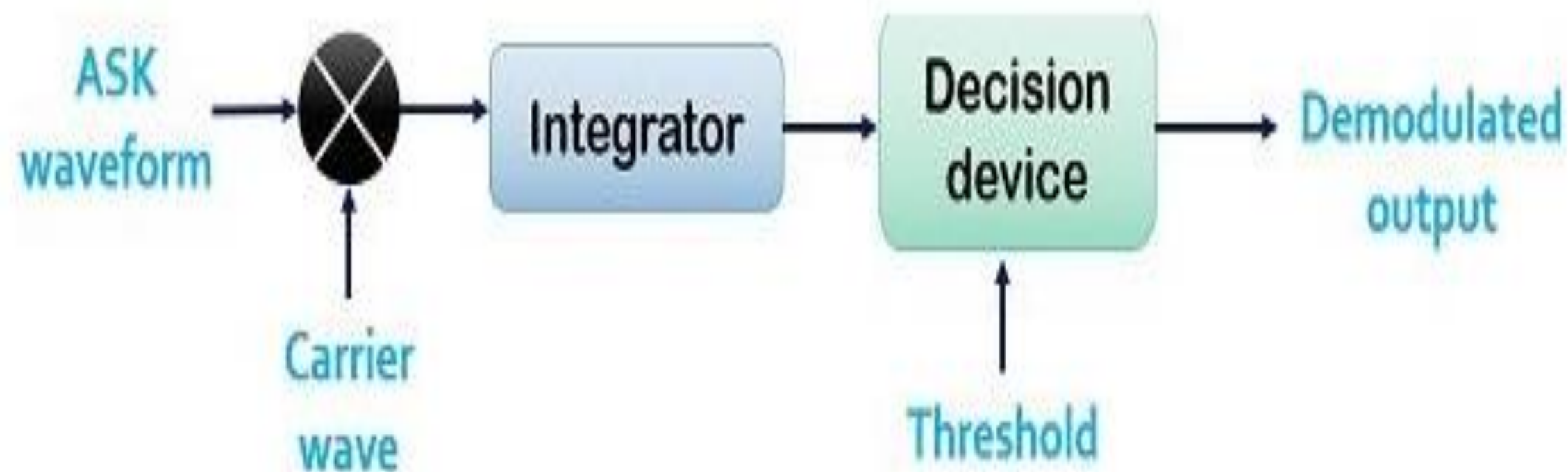


DETECTION OF ASK SIGNAL



- Detection or demodulation is the process of recovering original message signal from the modulated waveform.

Coherent detection



- It is noteworthy in case of coherent detection that the carrier at the receiver must be in synchronization with the carrier at the transmitter for accurate detection.



COHERENT DETECTION



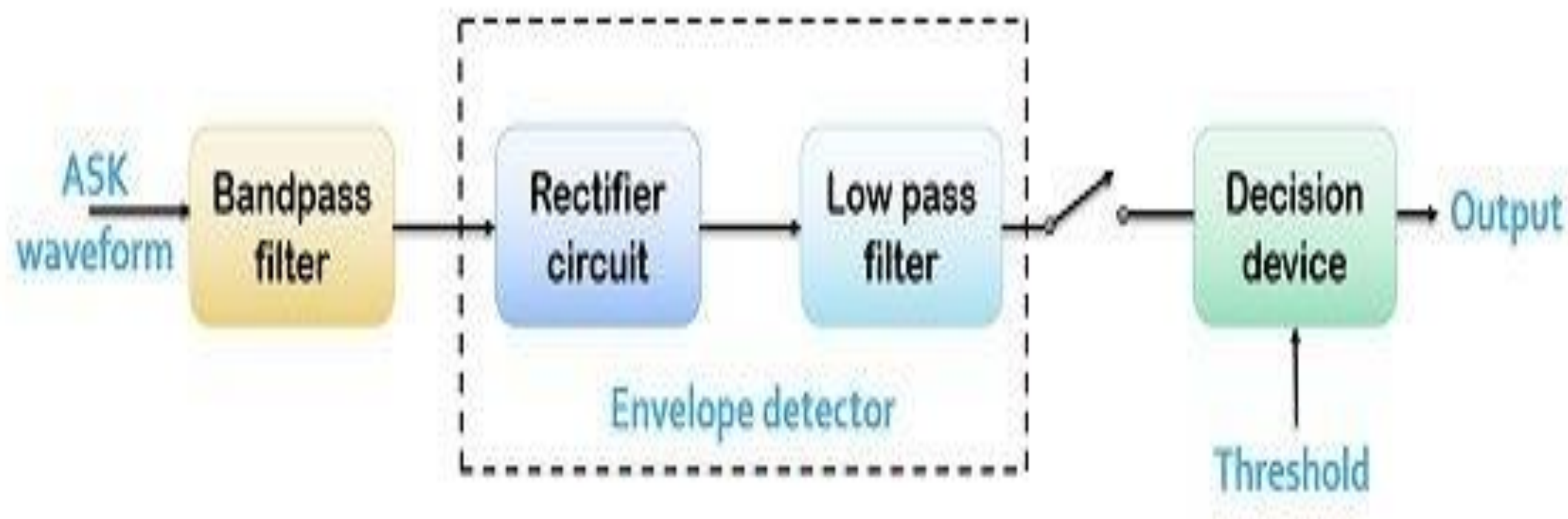
- The demodulation circuitry consists of a product modulator along with an integrator and a decision-making device. Here, the input to the product modulator is modulated waveform along with the sinusoidal carrier.
- The combination of the two is then fed to the integrator that operates successively according to the bit interval.
- After which it also executes low pass filtration of the signal. Then the output of the integrator acts as input to the decision device. Also, a preset threshold is provided to the decision-making device.
- The decision device compares the signal at its input with the threshold value. When the signal exceeds the threshold value then bit 1 is provided by the decision device as its output.
- However, when the signal deceeds (be less than) the threshold value then bit 0 is achieved.



NON - COHERENT DETECTION



A coherent detection technique somewhat leads to a complex design as it needs synchronization. However, the design can be simplified by non-coherent detection that makes use of envelope detector.





- The figure below shows the block diagram of a non-coherent ASK detection technique composed of a bandpass filter and envelope detector along with a decision device.
- As it does not require a synchronized carrier thus the method makes use of the rectifier circuit for the rectification of the signal. After which the signal is fed to the low pass filter.
- The output of which is then provided to a decision device that compares the signal value with the preset threshold value in a similar manner as done in the coherent detection.
- Thus generates the equivalent output, which is the original digital bit stream.



ADVANTAGES,DISADVANTAGES AND APPLICATIONS OF ASK



ADVANTAGES

- Its generation and detection are easy thus facilitate simple transmitter and receiver sections.

DISADVANTAGES

- ASK technique is not suitable for high bit rate data transmission.
- Poor bandwidth efficiency.
- Highly susceptible to noise and other external factors.

APPLICATIONS

- 1.Digital data through an optical fiber is transmitted using ASK technique.
- 2.The technique was widely used in traditional telephone modems.



ASSESSMENT



1. Why ASK is called ON-OFF Shift Keying
2. Define Bit and Baud Rate.
3. Mention the applications of ASK



THANK YOU