Prob (1) What are the main elements of the digital communication system? Sketch and explain the function of each element.

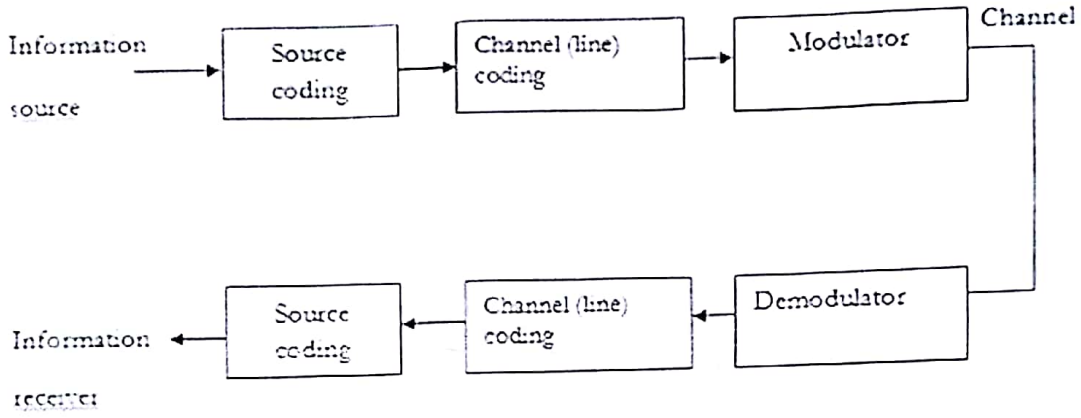

Fig: Digital communication system

- The elements of basic analog communication system are input signal or information, input transducer, transmitter, channel, Noise, Receiver, Output transducer.

1. Information or Input signal:

- The information is transmitted from one place to another.
- This information can be in the form of a sound signal like speech, or it can be in the form of pictures or it can be in the form of data information.

2. Input transducer:

- The information in the form of sound, picture or data signals cannot be transmitted as it is.
- First it has to be converted into a suitable electrical signal.
- The input transducer block does this job.
- The input transducers commonly used are microphones, TV etc.

3. Transmitter:

- The function of the transmitter is to convert the electrical equivalent of the information to a suitable form so that it can transfer over long distance.
- Basic block in transmitter are: Amplifier, Oscillator, Mixer.

4. Channel:

- The communication channel is the medium used for transmission of electrical signal from one place to other.
- The communication medium can be conducting wires, cables, optical fibres or free space.
- Depending on the type of communication medium, two types of communication system exists.
- Line communication: The line communication systems use the communication medium like the simple wires or cables or optical fibres. Eg: Telephone, Cable TV.
- Radio communication: The radio communication systems use the free space as their communication medium. The transmitted signal is in the form of electromagnetic waves. E.g. Mobile communication, satellite communication.

5.Noise:

- Noise is an unwanted electrical signal which gets added to the transmitted signal when it is travelling towards the receiver.
- Due to noise quality of information gets degrade.
- Once added the noise cannot be separated out from the information

6.Receiver:

- The receiver always converts the modulated signal into original signal which consist of Amplifier, Oscillator, Mixer.

7.Output transducer:

- Output transducer converts electrical signal into the original form i.e. sound or TV pictures etc.
- E.g. Loudspeaker, data and image convertor.

- In this diagram three basic signal processing operations have been included. They are:
  1. **Source coding:**
     - In source coding the encoder converts the digital signal generated at the source output into another signal in digital form.
     - Different source coding techniques are PCM (Pulse code modulation) DM(Delta modulation).

  2. Channel coding:

     - Channel encoding is done to minimize the effect of channel noise.
     - This will reduce the number of errors in the received data and will make the system more reliable.

  3.Modulation:

- Modulation is used for providing an efficient transmission of the signal over the channel.
- The detector is used for demodulation channel decoder and source decoder has exactly the opposite roles to play as compared to the channel encoder and source encoder respectively.
- If the information rate is maximum Digital modulation technique can be used because due to the digital nature of the signal, it is possible to use the advanced processing techniques such as digital signal processing, image processing, and data compression

Probl (2): Define

Information rate: A formula for measuring the amount of information received by multiplying the amount of information content for each character by the number of characters that are being transmitted every second.

Question2 (10marks):

1) What are the advantages and dis advantages of digital
2) communication over analog communication **(4 marks)**
3) **State** the function of source coding **(3 marks)**
   Function: converting the input from its original to a sequence of bits
   Types: discrete source encoder
4) **Why** communication systems are designed in a power – limited environment? To achieve a target error rate of data transmission with as low signal power as possible.**(3 marks)**