

Q1. What are the advantages of using digital communication over standard analog communication? What is the same for disadvantages?

→ Advantages of Digital communication:

- Regenerative repeating
- Storage of signal is possible.
- Larger noise immunity.
- Computerised signal processing.
- Larger noise immunity.

→ Disadvantages over analog communication.

- Higher bandwidth requirement.

Q2. Why do we not expect any channel noise in transmission system of digital signal?

→ In case of Digital communication, at receiver's end, instead of amplifying signal like in analog communication, the inputs are instead detected as input sequence bits and then regenerated to the specified line code. This process is known as regenerative repeating.

→ Regenerative repeating ensures minimal to no noise transmission.

Q3. What are the various ways of reducing quantization noise in digital communication?

→ Ways of reducing quantisation noise :-

- Increasing the value/number of encoder bits.
- Non uniform quantisation
- Use of differentiated quantization.

Q4. What is the relationship between the signal to quantization noise ratio & number of bits used in encoder system?

For a PCM System

$$\frac{S}{N_q} = \frac{3}{2} 2^{2n} \Rightarrow n \text{ is number of encoder bits}$$

$\text{SNR} \propto 2^{2n}$ , hence doubling the number of bits will quadruple the SNR performance.

In decible system the relation is linear,

$$\text{SNR}_{\text{db}} = 6.02n + 1.8$$

Q5. What is the relationship between the bandwidth of transmission & bit rate of transmission.

→ The minimum theoretical bandwidth required for transmission is equal to half the bit rate of transmission.

$$\boxed{BW = \frac{R_b}{2}}$$



Q6. Why is non uniform quantization called companding?

→ The representation of a non linear with similar signal to quantisation ratio results in a decreased no. of transmission bits [compression].

Thus the compressor reduces the no of transmission bits per sample and the expander does the opposite.

Q7. What are some of the common application of PCM system & companding?

Ans Application of PCM:-

- Satellite transmission
- Telephony
- Compact Disk.

Application of companding:-

- Compression before input to ADC
- Expansion after ADC
- Digital telephony.

Q8. In practical use of PCM, what is usually the number of encoder bits that is used & why?

Ans. Practically the no. of encoder bits are used in 8-bit groups / combination called bytes.