

UNIT II

DIGITAL COMMUNICATION

1. What are the advantages of digital transmission?

The advantage of digital transmission over analog transmission is noise immunity. Digital pulses are less susceptible than analog signals to variations caused by noise.

- Digital signals are better suited to processing and multiplexing than analog signals.
- Digital transmission systems are more noise resistant than the analog transmission systems.
- Digital systems are better suited to evaluate error performance.

2. Define pulse code modulation.

In pulse code modulation, analog signal is sampled and converted to fixed length, serial binary number for transmission. The binary number varies according to the amplitude of the analog signal.

3. What is the purpose of the sample and hold circuit?

The sample and hold circuit periodically samples the analog input signal and converts those samples to a multilevel PAM signal.

4. What is the Nyquist sampling rate?

Nyquist sampling rate states that, the minimum sampling rate is equal to twice the highest audio input frequency.

5. Define and state the causes of fold over distortion.

The minimum sampling rate(f_s) is equal to twice the highest audio input frequency(f_a). If f_s is less than two times f_a , distortion will result. The distortion is called aliasing or fold over distortion. The side frequencies from one harmonic fold over into the sideband of another harmonic. The frequency that folds over is an alias of the input signal hence, the names "aliasing" or "fold over distortion"

6. Define overload distortion.

If the magnitude of sample exceeds the highest quantization interval, overload distortion occurs.

7. Define dynamic range.

Dynamic range is the ratio of the largest possible magnitude to the smallest possible magnitude. Mathematically, dynamic range is $DR = V_{max} / V_{min}$

8. Define coding efficiency.

Coding efficiency is the ratio of the minimum number of bits required to achieve a certain dynamic range to the actual number of PCM bits used. Mathematically, coding efficiency is $\text{Coding efficiency} = \frac{\text{Minimum number of bits (including sign bit)}}{\text{Actual number of bits (including sign bit)}} \times 100$

9. Define companding.

Companding is the process of compressing, then expanding. With companded systems, the higher amplitude analog signals are compressed prior to transmission, then expanded at the receiver.

10. Define slope overload. How it is reduced.

The slope of the analog signal is greater than the delta modulator can maintain, and is called slope overload. Slope overload is reduced by increasing the clock frequency and by increasing the magnitude of the minimum step size.

11. Define granular noise. How it is reduced.

When the original input signal has relatively constant amplitude, the reconstructed signal has variations that were not present in the original signal. This is called granular noise. Granular noise can be reduced by decreasing the step size.

12. Define adaptive delta modulation.

Adaptive delta modulation is a delta modulation system where the step size of the AC is automatically varied depending on the amplitude characteristics of the analog input signal.

13. Define modulation index for FSK.

The modulation index in FSK is defined as $h = (\Delta f) / f_m$ where h = FM modulation index called the h factor in FSK f_m = fundamental frequency of the binary modulating signal (Δf) = Peak frequency deviation (hertz)

14. Define bit rate.

In digital modulation, the rate of change at the input to the modulator is called the bit rate (fb) and has the unit of bits per second (bps).

15. Define Baud rate.

The rate of change at the output of the modulator is called baud.

16. Define QAM.

Quadrature amplitude modulation is a form of digital modulation where the digital information is contained in both the amplitude and phase of the transmitted carrier.

17. Define quantization.

Quantization is a process of approximation or rounding off. Assigning PCM codes to absolute magnitudes is called quantizing.

16 MARKS

1. State and prove sampling theorem.
2. Explain the generation of PWM & PPM Waves.
3. Compare PCM, DPCM, DM & ADM
4. Explain in detail about the process of generating Delta Modulated signal.
5. Explain the concept of BPSK & QPSK technique in data communication.
6. With a neat diagram, describe the method for generating & detecting Pulse Amplitude modulated signal.
7. With a neat block diagram, explain the process of generating DPCM signal.