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**DCAN202 Week 2 Tutorial – Data Communication and Networking**

**1. What is the difference between data and signals?** ­­­­­­­­­­­­­­­­­­­­­­

**Ans:-**

**Data:** Data refers to entities that convey meaning, such as computer files, documents, or audio files. They are the actual information being sent or stored.

**Signals**: Signals are the electric or electromagnetic impulses used to encode and transmit this data. Signals can be analog or digital and are the medium through which data is communicated.

**2. What is the difference between Analog and Digital waveform? Explain with examples.**

**Ans:-**

**Analog Waveforms**: These are continuous signals that can take any value within a given range. Examples include sound waves from music or voice conversations over the phone. Analog signals are more susceptible to noise and degradation as they travel.

**Digital Waveforms**: These signals are discrete, meaning they can only take specific values, such as 0 or 1. They are often represented by square waves. Examples include text messages or emails. Digital signals are more resistant to noise and easier to amplify or process without distortion.

**3. What are the main advantages of digital signals over analog signals?**

Ans:-

The main advantages of digital signals include:

**Noise Resistance**: Digital signals are less susceptible to degradation from noise.

**Easy Amplification**: Digital signals can be amplified without introducing additional noise.

**Error Detection and Correction**: Digital systems can detect and correct errors more efficiently.

**Flexibility**: Digital signals can be easily processed, stored, and transmitted using a wide range of technologies.

**4. What is Loss of Signal Strength? How do you measure it? What if a signal starts at 100 watts and ends at 50 watts? What is dB loss?**

Ans:-

**Loss of Signal Strength**, commonly known as attenuation, occurs as signals travel over distances. It is measured in decibels (dB), which quantify the ratio of final signal power (P2) to initial signal power (P1). The formula for dB loss is:

dB=10×log10(P2/P1)

If a signal starts at 100 watts and ends at 50 watts, the dB loss is calculated as follows:

dB=10×log10(50100)=10×log10(0.5)=10×−0.3=−3 dB

Thus, a 3 dB loss means the signal has lost half its power.

**5. Explain three basic techniques of transmitting digital data with discrete analog signals**

Ans:-

To transmit digital data using analog signals, three primary techniques are employed:

1. **Amplitude Shift Keying (ASK)**: This method varies the amplitude (height) of the carrier signal. One amplitude level typically represents a binary 0, and another represents a binary 1.
2. **Frequency Shift Keying (FSK)**: In FSK, the frequency of the carrier signal is changed. Different frequencies correspond to different digital states.
3. **Phase Shift Keying (PSK)**: This technique changes the phase of the carrier signal. Various phase changes can be used to encode multiple bits per symbol.