Short Answer Type Questions

Signals & Transmission Media

Q-1. Distinguish between data and signal.

Ans: Data is an entity, which conveys some meaning. On the other hand, the signal is a representation of data in some electric, electromagnetic or optical form. So, whenever data needs to be sent, it has to be converted into signal of some form for transmission over a suitable medium.

Q-2. What do you mean by a "Periodic Signal"? And what are the three parameters that characterize it?

Ans: *A* signal is *periodic signal* if it completes a pattern within a measurable timeframe. A periodic signal is characterized by the following three parameters.

Amplitude: It is the value of the signal at different instants of time. It is measured in volts.

Frequency: It is inverse of the time period, i.e. f=1/T. The unit of frequency is Hertz (Hz) or cycles per second.

Phase: It gives a measure of the relative position in time of two signals within a single period.

Q-3. Distinguish between time domain and frequency domain representation of a signal.

Ans: Time Domain Representation: Whenever a signal is represented as a function of time, it is called time domain representation. An electromagnetic signal can be either continuous or discrete. It is represented as s (t).

Frequency Domain Representation: Whenever a signal is represented as a function of frequency, it is called frequency domain representation. It is expressed in terms of different frequency components and represented as s (f).

Q-4. What equipments are used to visualize electrical signals in time domain and frequency domain?

Ans: Cathode Ray Oscilloscope is used to visualize electrical signals in time domain and Spectrum Analyzer used to visualize electrical signals in frequency domain.

Q-5. What do you mean by the Bit Interval and Bit rate in a digital signal?

Ans: The ***bit interval*** is the time required to send one single bit. The ***bit rate*** is the number of bit intervals per second. This mean that the bit rate is the number of bits send in one second, usually expressed in bits per second (bps).

Q-6. On what parameters the quality of transmission depends in case of guided transmission media?

Ans: It is mainly decided by the frequency of transmission and the characteristics of the transmission media.

Q-7. Why wires are twisted in case of twisted pair of transmission medium?

Ans: It minimizes electromagnetic interferences between the pairs of wires, which are bundled together, so that the cross talk is minimum.

Q-8. Give a popular example where co-axial cables are used for broadband signaling.

Ans: Use of co-axial cable for broadband signaling is cable TV (CATV) application.

Q-9. What devices are used as source and detector in case of single mode of fiber?

Ans: LASER is used as source and photodiode is used as detector in case of single mode of fiber.

Q-10. In what way multi-mode and single-mode fibers differ?

Ans: The core diameter of single-mode fiber is much smaller than that of multi-mode fiber. For example,

For multi-mode fiber:

- Core diameter lies in the range of 50-200μm
- Cladding diameter lies in the range of 125-400μm
- Repeater spacing is 2Km.

For single-mode fiber:

- Core diameter lies in the range of 8-12μm
- Cladding diameter 125μm
- Repeater spacing is 20Km.

Q-11. Why does single-mode fibres are used for large distance communications rather than multi-mode fibres?

Ans: In a multi-mode fiber, the quality of signal-encoded light deteriorates more rapidly than single-mode fiber, because of interference of many light rays. As a consequence, single-mode fiber allows

longer distances without repeater. For multi-mode fiber, the typical maximum length of the cable without a repeater is 2km, whereas for single-mode fiber it is 20km.

Q-12. What is crosstalk? How is it minimized in case of twisted-pair of wire?

Ans:

(a) Crosstalk refers to the picking up of electromagnetic signals from other adjacent wires by electromagnetic induction.

(b) When a pair of wires is twisted together, the electromagnetic signals generated by the two wires cancel each other as these are of opposite polarity. This helps to reduce the susceptibility of interference to the adjacent wires.

Q-13. What are the factors responsible for attenuation in case of terrestrial microwave communication?

Ans: Attenuation due to distance is 10 log $(4\pi d/\lambda)^2$. Factors responsible for attenuation are given below:

- **Distance** – Attenuation is more if distance increases.
- **Wavelength** – Attenuation is less if wavelength is longer. (i.e. high frequency components are attenuated more than the low frequency component)
- **Rainfall** – Attenuation is less if there is no rain.

Q-14. What parameters decide the spacing of repeaters in case of terrestrial microwave communication?

Ans: Parameters are the height of the antenna 'h' and adjustment factor 'k' based on the relation $d=7.14\sqrt{kh}$, where d is the distance in Km between two the two antennas.

Q-15. Why two separate frequencies are used for uplink and downlink transmission in case of satellite communication?

Ans: Two separate frequencies are used so that one cannot interfere with the other and full duplex communication is possible. And other reason is that the Power required to transmit a signal is proportional to the frequency of the signal. And more power requirement more would be the weight of the system. As there are constraints on the load that can be carried with the satellite, mainly down linking frequency is lower than the up linking one.

Q-16. Why uplink frequencies are higher than downlink frequencies in case of satellite communication?

Ans: The satellite gets power from solar cell. So, the transmitter is not being of higher power. On the other hand the ground station can have much higher power. As we want less attenuation and better signal-to-noise ratio, lower frequency is more suitable for downlink and higher frequency is commonly used for uplink.