**Assignment 2**

1. What are the advantages of fiber optics over copper as a transmission medium? Is there any downside of using fiber optics over copper?

Advantages: Fiber’s transmission distance is longer than cooper. Fiber can provide much higher bandwidth than cooper. Fiber is harder to tap than cooper.

Disadvantages: The cost of set up wires is cheaper than fiber. Fiber requires special equipment to cut. Cooper is easier to use.

1. Radio antennas often work best when the diameter of the antenna is equal to the wavelength of the radio wave. Reasonable antennas range from **1 cm to 5 meters** in diameter. What frequency range does this cover?

2400bps

1. Calculate the end-to-end transit time for a packet for both GEO (altitude: 35,800 km), MEO (altitude: 18,000 km) and LEO (altitude: 750 km) satellites.

GEO=2\*(35800000/300000000)=0.239s

MEO=2\*(18000000/300000000)=0.12s

LEO=2\*(750000/300000000)=0.005s

1. Ten signals, each requiring 4000 Hz, are multiplexed onto a single channel using FDM. What is the minimum bandwidth required for the multiplexed channel? Assume that the guard bands are 400 Hz wide.

4000\*10+9\*400=43600Hz

1. Which of the following transmission medium will NOT be interfered by electromagnetic noises?
   1. UTP c) Fiber
   2. STP d) Co-ax

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1. What kind of transmission medium does Wi-Fi signal belong to? What about the Li-Fi?

Wi-Fi: Microware transmission; Li-Fi: light

1. Twisted pair is formed by twisting two insulated conductors. What is the main purpose of twisting?

Twisted reduce radiated signal.

1. What are the differences between single-mode fiber cables and multi-mode fiber cables? How are they used in differently?

Single-mode fiber cables: Core so narrow light can’t even bounce around. Multi-mode fiber cables: Light can bounce.

Single-mode fiber cables used with lasers for long distances. Multi-mode fiber cables used with LEDs for cheaper shorter distance links.

1. What are the differences between asynchronous and synchronous transmission?

1. In synchronous transmission, the clock of the sender and the receiver is strictly synchronized; In asynchronous transmission, the two parties use their own independent clocks or do not need an explicit clock signal to coordinate data transmission.

2. Synchronous transmission uses the timing information in the data for verification and processing to ensure the integrity and accuracy of the data. Asynchronous transmission usually adds additional control information before and after the character, which is used to identify the beginning and end of the character and for error detection.

3. Because synchronous transmission is based on a large data unit and does not require additional control information, its transmission efficiency is relatively high, and it is suitable for high-speed and large-capacity data transmission scenarios.

4. On the contrary, asynchronous transmission requires additional control information and smaller data processing units, resulting in lower transmission efficiency, but it is simpler and more economical, and is suitable for low-speed and small-scale data communication occasions

1. What are the differences between serial and parallel transmission?

Series transmission speed is slower, but more stable when transferring data over long distances, less signal interference, series transmission only requires a transmission line, less cost. Parallel transmission is fast, but it may be interfered with when transmitting signals.

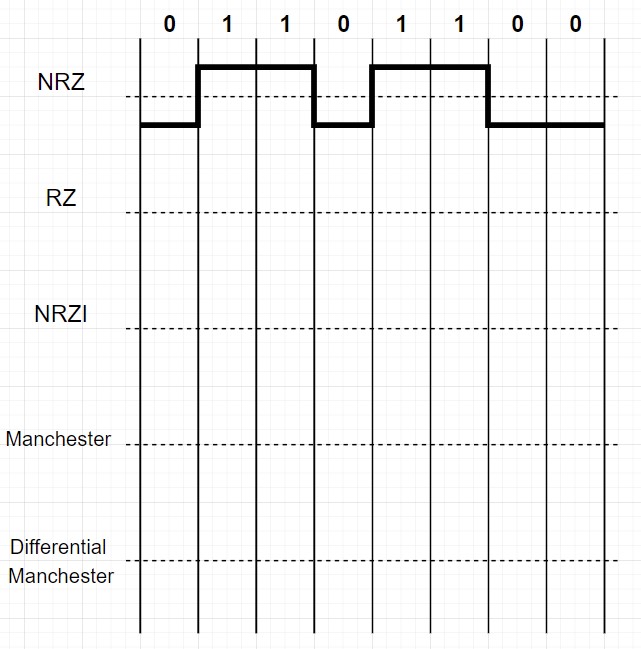
1. What are the differences between full-duplex, simplex and half-duplex link?

Full-duplex link: Used for transmission in both directions at once.

Half-duplex link” Both directions, but not at the same time.

Half-duplex link: Only one fixed direction at all times.

1. Please base on the following bit stream to draw proper RZ, NRZI, Manchester and Differential Manchester waveforms.



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