Tutorial 2

ELEC3506/9506 – Communication Networks

1. Distinguish between a signal element and a data element.

2. Distinguish between data rate and signal rate.

3. Define the characteristics of a self-synchronizing signal.

4. What are the differences between parallel and serial transmission.

5. Discuss the steps of PCM.

6. List different techniques of serial transmission and explain their differences.

7. Which characteristics of an analog signal are changed to represent the digital signal in each of the following digital-to-analog conversion?
    a. ASK
    b. FSK
    c. PSK
    d. QAM

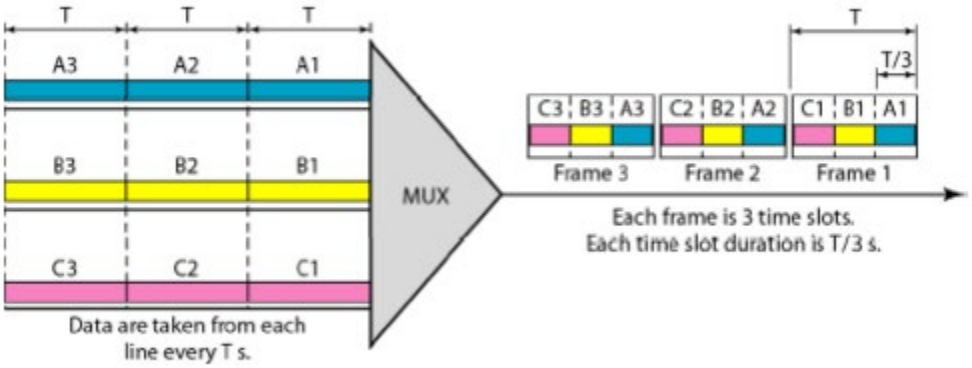
8. Which of the above four are most susceptible to noise? Explain your answer

9. What is the number of bits per baud for the following techniques?
    a. ASK with four different amplitudes
    b. FSK with 8 different frequencies
    c. PSK with four different phases

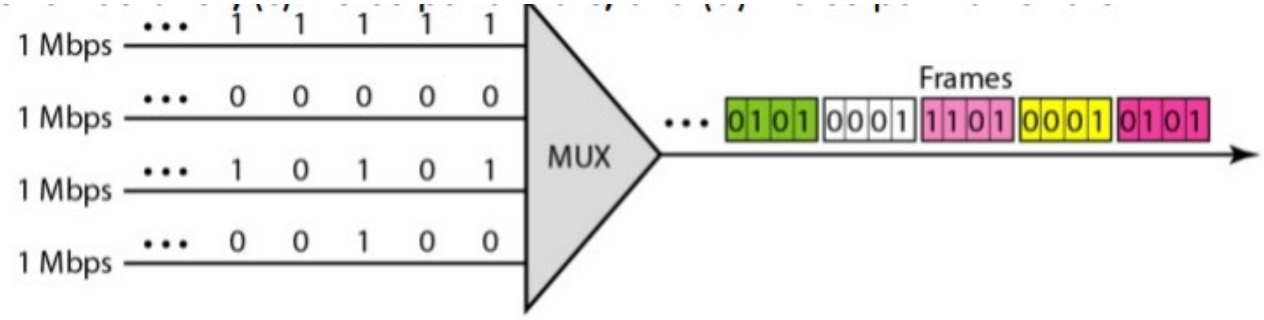
10. Assume that a voice channel occupies a bandwidth of 4kHz. We need to combine three voice channels into a link with a bandwidth of 12kHz, from 20 to 32kHz. Show the configuration, using the frequency domain. Assume there are no guard bands.

11. Five Channels, each with a 100kHz bandwidth, are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10kHz between the channels to prevent interference?

12. From the below figure, the data rate for each input connection is 3kbps. If 1 bit at a time is multiplexed (a unit is 1 bit), what is the duration of (a) each input slot, (b) each output slot, and (c) each frame?



13. The figure below shows synchronous TDM with a data stream for each input and one data stream for the output. The unit of data is 1 bit. Find (a) the input bit duration, (b) the output bit duration, (c) the output bit rate, and (d) the output frame rate.



14. List the main multiplexing techniques discussed in the lecture.

15. Which of them (Q14) are used for combining analog signals?

16. Which of them (Q14) are used for combining digital signals?

17. Which of the three multiplexing techniques is common for fiber optic links? Explain why.

18. Distinguish between synchronous TDM vs. statistical TDM.

19. Assume that a voice channel occupies a bandwidth of 4 kHz. We need to multiplex 10 voice channels with guard bands of 500 Hz using FDM. Calculate the required bandwidth.

20. We need to transmit 100 digitized voice channels using a pass-band channel of 20 KHz. What should be the ratio of bits/Hz if we use no guard band?

21. What is the significance of the twisting in twisted pair cable?

22. What is the purpose of cladding in optical fiber cable?

23. Name the advantages of optical fiber over twisted pair and coaxial cable.

24. How does sky propagation differ from line-of-sight propagation?

25. List three traditional switching methods.

26. What are the two approaches for packet switching?

27. Compare and contrast a circuit switched network and a packet switched network.

28. What is the role of the address field in a packet travelling through a datagram network?

29. What is the role of the address field in a packet travelling through a virtual-circuit network?

30. List four major components of a packet switch and their functions.