Study Questions Covering Weeks No. 1–2 Lectures

1. List the various guided transmission media and state the advantages/disadvantages of each of them.
2. List the various wireless transmissions and state the advantages/disadvantages of each of them.
3. Explain what crosstalk is? and what is needed to reduce it?
4. Which parts of the electromagnetic spectrum are used for communication?
5. Draw a graph to show the electromagnetic spectrum, i.e., the name of its various bands, and the frequency range of each band.
6. Explain the two modes for transmitting binary data across a link.
7. What are the advantages and disadvantages of parallel transmision?
8. Compare the two methods of serial transmission. Discuss the advantages and the disadvantages of each.
9. List the RS-232 specifications.
10. Sketch a waveform diagram to represent the letter "A" using RS-232 standard.
11. Sketch the minimal wiring required for full-duplex RS-232 communication.
12. Define Bandwidth, Bit rate, and Baud.
13. What is the unit of bandwidth?
14. Is it possible to change a signal faster than the bandwidth? Why?
15. State two relations between bandwidth and maximum bit rate?
16. Under which conditions the bit rate will equal the baud?
17. State Nyquist's theorem.
18. State Shannon's theorem.
19. In Shannon's theorem, what does N = 0 mean?
20. In Shannon's theorem, what does S = 0 mean?
21. How do engineers refer to the Signal-to-Noise ratio?
22. List the various modulation techniques?
23. Sketch a waveform diagram for letter "A" using the following methods. State any assumptions you used.
    (a) A binary signal
    (b) AM modulation
    (c) FM modulation
    (d) Phase shift modulation

24. What is the maximum bit rate that you can get out of a conventional voice telephone line?
    Note that the SNR ratio of a telephone line is about 30 dB
25. List the various types of modems. What is the advantage/disadvantage of each type.
26. What is the difference between full-duplex and half-duplex modems?
27. What will happen if two 56 Kbps modems are connected over a conventional telephone line?
28. In the Long-Distance Communication lecture, page 6, there is a modulation example.
    (a) Re-sketch part b in the this example when: "0" means half the amplitude and "1" means double the amplitude
    (b) Re-sketch part d in the this example when: "0" means shift of 90 degrees and "1" means shift of 270 degrees

    Include the original carrier wave in your answer, i.e., include your reference sine wave.
29. List the specification of V.32 modem standard.
30. List the specification of V.32 bis modem standard.
31. List the specification of V.34 modem standard.
32. List the specification of V.42 modem standard.
33. List the specification of V.42 bis modem standard.
34. List the specification of V.90 modem standard.
35. List the various types of multiplexing?
    Give an example for each of type.
36. Define the terms
    (a) Time division multiplexing
    (b) Frequency division multiplexing
37. What is the difference between frequency division multiplexing and color division multiplexing?
38. What is byte-stuffing? and state when is it used?
39. What is the maximum and minimum number of characters that you will get after applying byte stuffing to N bytes?
40. List 3 different techniques to detect transmission errors in frames.

41. State the basic idea behind:
    (a) Parity checking
    (b) Check sum
    (c) CRC
42. Compare between the following schemes from the performance point of view
    (a) Parity checking
    (b) Check sum
    (c) CRC
43. What is the difference between even parity and odd parity?
44. What does CRC stand for?
45. How does the CRC checker know that the received data unit is damaged?
46. What are the conditions for the polynomial used by the CRC generator?
47. what kind of arithmetic is used to add segments in:
    (a) The check sum
    (b) The CRC
48. How can the CRC procedure be implemented using hardware?
    Put your answer in a point form.
49. If a divisor is 101101, how many bits long is the CRC?
50. Find the binary equivalent of $x^8 + x^3 + x + 1$.
51. Find the polynomial equivalent of 10000101010010011.
52. Where is the CRC usually placed inside the frame? Why?
53. Do we need byte stuffing for the CRC value? Why?
    State all possible error cases.