CHAPTER 6

Transmission of Digital Data: Interfaces and Modems

6.1 REVIEW QUESTIONS

1. In parallel mode, bits are grouped together and transmitted simultaneously over separate communication lines. In serial mode, all bits are transmitted over only one communication line and one bit follows another.
3. In asynchronous transmission, there is no timing needed at the byte level, because information is received and translated by agreed-upon patterns. This method is mostly used for low-speed communication. In synchronous transmission, timing is very important. This method is very fast and used for high-speed transmissions.
5. EIA and ITU-T have been involved in developing DTE/DCE interfaces.
7. DB-25 and DB-9 are implementations of EIA-232. DB-9 has fewer pins and fewer functions and is used in a single asynchronous connection, while DB-25 allows full-duplex transmission.
9. In a null modem, links must be crossed. Pin 2 is for transmitting data and pin 3 is for receiving data. Therefore pin 2 of the first DTE connects to pin 3 of the second DTE and pin 2 of the second DTE connects to pin 3 of the first DTE.
11. X.21 eliminates most of the control circuits by directing their traffic over data circuits.
13. A modulator converts a digital signal into an analog signal using ASK, FSK, PSK or QAM. A demodulator converts an analog signal into a digital signal; it reverses the process of modulation.
15. Every line has an upper and a lower limit of frequencies of the signals it can carry. This limited range of frequencies is the bandwidth. Traditional phone lines have a bandwidth of 3 to 4 KHz.
17. Downloading has a maximum of 56 Kbps and uploading has a maximum of 33.6 Kbps because the process of downloading does not involve quantization using PCM.
19. The primary channel is used to transmit data; the secondary channel is used mostly for flow control in half-duplex mode.

21. An unbalanced circuit has one line for signal propagation, while a balanced circuit has two lines.
23. A user types one character at a time producing unpredictable gaps between characters. Only asynchronous transmission will be effective in this case.
25. The electrical specification defines the voltage level and the type of signal transmitted.
27. Category I includes those pins whose functions are compatible to those in EIA-232. Category II pins have no equivalent to EIA-232 or have been redefined.
29. In full-duplex transmission the available bandwidth is divided into two, one for each direction.
31. In a four-wire system, each pair of wires can be used for transmission in each direction. The capacity is therefore twice of that of a two-wire system.

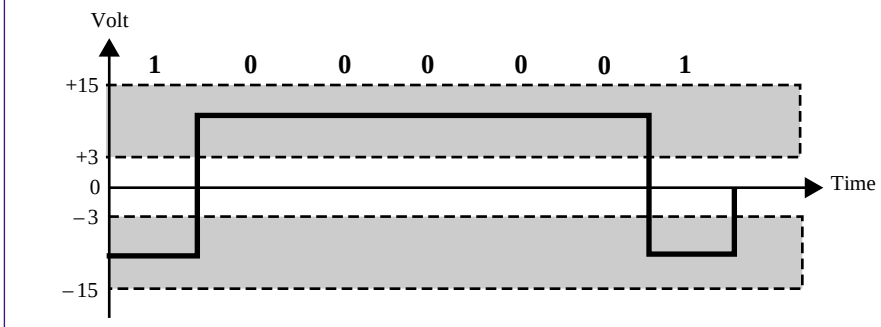
6.2 MULTIPLE CHOICE QUESTIONS

33. c 35. a 37. d 39. b 41. b 43. c 45. a 47. d 49. d 51. d
53. c 55. b 57. c 59. a 61. a 63. c 65. b 67. d 69. a 71. b
73. d 75. a 77. a 79. d 81. d

6.3 EXERCISES

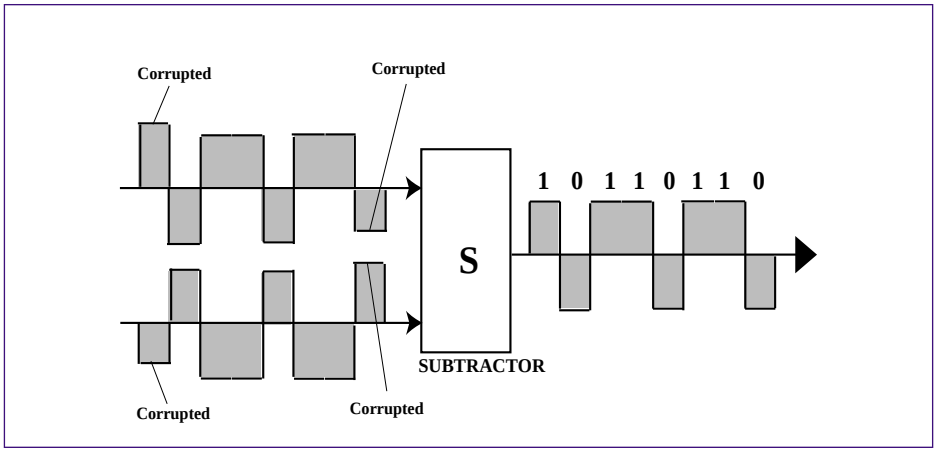
83. See Figure 6.1.

Figure 6.1 *Exercise 83*



85. See Figure 6.2.
87. Downloading: $6 \times 7 = 42$ Mbps Uploading: $6 \times 3 = 18$ Mbps
89. ATTD4088648902E0
91. 9 pins (DB-9)

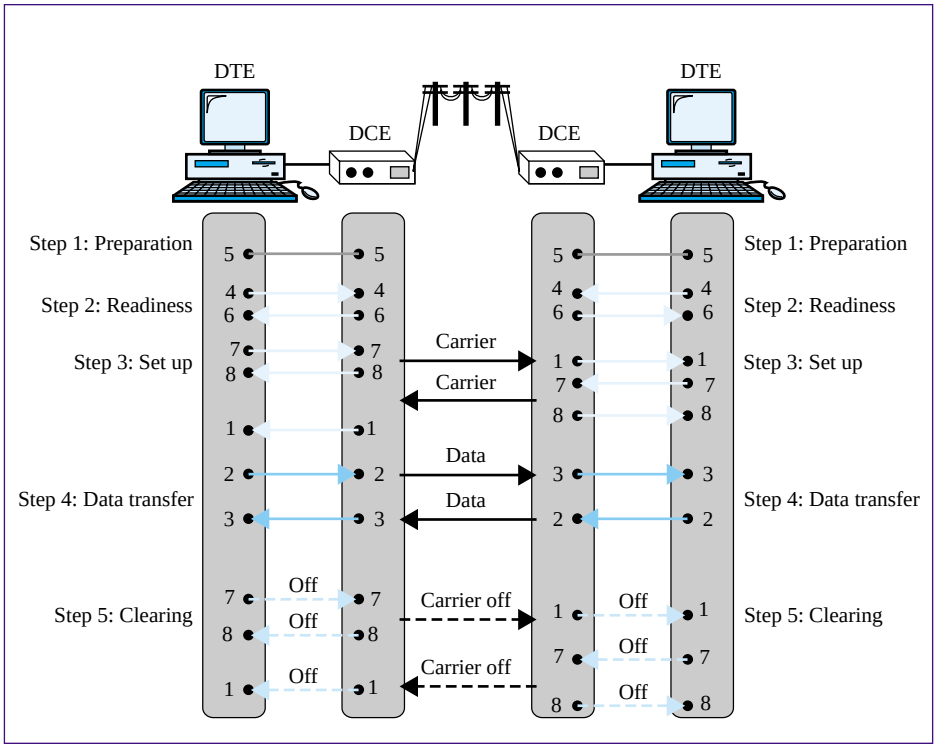
Figure 6.2 *Exercise 85*



93. 5 pins

95. See Figure 6.3.

Figure 6.3 *Exercise 95*



97. If we assume a linear relationship, we will get approximately 7.6 Mbps.

99. We use seven-bit ASCII without parity, with a 0 start bit and a 1 stop bit. If data is sent with the most significant bit first, we have the following:

⇐ 010010001 011001011 011011001 011011001 011011111
H e l l o

101. See Figure 6.4.

Figure 6.4 *Exercise 101*