CHAPTER 3

Underlying Technologies

3.1 MULTIPLE-CHOICE QUESTIONS

1. c	2. c	3. c	4. c	5. b	6. b	7. a	8. b	9. a	10. d
11. a	12. b	13. a	14. d	15. d	16. a	17. b	18. c	19. a	20. d
21. a	22. c	23. d							

3.2 EXERCISES

24. When more than one signal occupies the line at the same time, a collision is the result.

25. A station on a busy CSMA/CD LAN is likely to wait longer than a station on a busy token ring LAN because on the token ring, each station has an equal opportunity to send a frame as the token circulates around the ring. In this way, all stations have equal access to the LAN and no station has to wait very long to send each frame. On a CSMA/CD LAN with heavy traffic, there will be many collisions. After each collision, any station wishing to send data must wait for a random period of time before trying to transmit data. It may take some time for a station to be able to send the data.

26. The Ethernet frame must have a minimum data size because a sending station must be able to sense a collision before the entire frame is sent. The minimum size of an Ethernet network is therefore determined by the minimum frame size. If there is no minimum data size, the minimum frame size would be only 27 bytes (26 byte header + 1 byte of data) which would make the minimum network size much shorter.

27. Speed of propagation: 200,000,000 meters/second

    2500 meters / 200,000,000 meters/second = 12.5 microseconds

    It would take a bit 12.5 microseconds to travel 2500 meters.

28. In the worst case, the collision would be sensed in $2 \times 12.5 = 25$ microseconds.

29. Assume that the minimum frame size is 65 bytes.
    65 bytes × 8 bits / byte = 520 bits.
    If the data rate is 10 Mbps, 520 bits can be generated in:
    520 bits / 10,000,000 bits/second = 52 microseconds
30. Let X equal the minimum number of bits. Then,
    X bits / 10,000,000 bits/second = 0.000025 seconds
    X = 10,000,000 × 0.000025 = 250 bits
    250 bits / 8 = 31.25 bytes
    The minimum frame size would have to be larger than 32 bytes for an Ethernet network of length 2500 meters to work properly.
31. 46 - 42 = 4
32. No, the data cannot be encapsulated in one frame. Two frames need to be sent. One frame has 1500 bytes of data; the other has 10 plus 36 bytes of padding.