Chapter **14**

Computer Networks

1. Protocols are
   - (a) agreements on how communication components and DTE's are to communicate
   - (b) logical communication channels used for transferring data
   - (c) physical communication channels used for transferring data
   - (d) none of the above

2. The method of communication in which transmission takes place in both directions, but only in one direction at a time is called
   - (a) simplex
   - (b) four wire circuit
   - (c) full duplex
   - (d) half duplex

3. Error detection at the data link level is achieved by
   - (a) bit stuffing
   - (b) cyclic redundancy codes
   - (c) Hamming codes
   - (d) equalization

4. Which of the following is a wrong example of a network layer?
   - (a) Internet Protocol (IP)-ARPANET
   - (b) X.25 Packet Level Protocol (PLP)-ISO
   - (c) Source routing and domain naming-USENET
   - (d) X.25 level 2-ISO

5. The topology with highest reliability is
   - (a) bus topology
   - (b) star topology
   - (c) ring topology
   - (d) mesh topology

6. baud means
   - (a) the number of bits transmitted per unit time
   - (b) the number of bytes transmitted per unit time

    (c) the rate at which the signal changes

    (d) none of the above

7. Start and stop bits are used in serial communication for

    (a) error detection   (b) error correction

    (c) synchronization   (d) slowing down the communication

8. Unmodulated signal coming from a transmitter is known as

    (a) carrier signal   (b) baseband signal   (c) primary signal   (d) none of the above

*9. Manchester code is a

    (a) Bi-polar code   (b) non return to zero code

    (c) polar code   (d) none of the above

10. Pick the incorrect statements.

    (a) Another name for primary/secondary protocol is master/slave.

    (b) Peer to peer protocol provides equal status to all sites on the channel.

    (c) Priority, non-priority types come under master/slave protocol.

    (d) TDM is a primary/secondary non-priority system.

11. Pick the correct statements.

    (a) A switched circuit is a dial-up circuit that may encounter blockage (busy signal).

    (b) Non switched leased line supports higher data volume and quality than switched lines.

    (c) Non switched lines are expensive for high volume data.

    (d) Switched circuit provides faster response time.

12. Pick the incorrect statements that pertain to error retransmission used in continuous ARQ method.

    (a) Go-back-N method requires more storage at the receiving site.

    (b) Selective Repeat involves complex login than Go-back-N.

    (c) Go-back-N has better line utilisation.

    (d) Selective Repeat has better line utilisation.

13. In the carrier sense network if the prevailing condition is a 'channel busy', then which of the following are correct?

    (a) If the technique used is non-persistent then it results in randomised wait and sense.

    (b) If the technique used is 1-persistent then the channel is continually sensed.

    (c) If the technique used is p-persistent then randomised retransmission is done.

    (d) If the method used is non-persistent then continuous sensing results.

14. Which of the following are non-polling systems?

    (a) TDMA   (b) Stop and Wait

    (c) `Xon/Xoff`   (d) Continuous ARQ

15. Pick the systems that can be used in both priority and non-priority modes.

    (a) TDM   (b) Register insertion

    (c) Carrier sense systems   (d) Token passing

*16. How many characters per sec (7 bits + 1 parity) can be transmitted over a 2400 bps line if the transfer is synchronous (1 `start` and 1 `stop` bit)?

    (a) 300   (b) 240   (c) 250   (d) 275

27. Which one of the following network uses dynamic or adaptive routing?

(a) TYMNET

(b) ARPANET

(c) SNA (IBM's System Network Architecture)

(d) None of the above

*28. The number of cross point needed for 10 lines in a cross point switch which is full duplex in nature and there are no self connection is

(a) 100　　　　　(b) 45　　　　　(c) 50　　　　　(d) 90

*29. A terminal multiplexer has six 1200 bps terminals and 'n' 300 bps terminals connected to it. The outgoing line is 9600 bps. What is the maximum value of n?

(a) 4　　　　　(b) 16　　　　　(c) 8　　　　　(d) 28

30. The difference between a multiplexer and a statistical multiplexer is:

(a) Multiplexers use TDM (time division multiplexing), while statistical multiplexer uses FDM (frequency division multiplexing).

(b) Multiplexers often waste the output link capacity, while statistical multiplexers optimize its use.

(c) Statistical multiplexers need buffers while multiplexers do not need buffers.

(d) Multiplexers use the X.25 protocol, while statistical multiplexers use the ALOHA protocol.

31. A modem constellation diagram has data points at (0, 1) and (0, 2). What type of modulation does the modem use?

(a) Phase modulation　　　　　(b) Amplitude modulation

(c) Both (a) and (b)　　　　　(d) None of the above

32. Write the differential Manchester code for the given sketch

(a) 111100101　　　(b) 100010111　　　(c) 101001111　　　(d) 101001101

*33. Maximum data rate of a channel for a noiseless 3-kHz binary channel is

(a) 3000 bps　　　(b) 6000 bps　　　(c) 1500 bps　　　(d) none of the above

*34. The maximum data rate of a channel of 3000-Hz bandwidth and SNR of 30 dB is

(a) 15,000 bps　　　(b) 60,000 bps　　　(c) 30,000 bps　　　(d) 3,000 bps

*35. In time division switches if each memory access takes 100 ns and one frame period is 125 μs, then the maximum number of lines that can be supported is

(a) 625 lines　　　(b) 1250 lines　　　(c) 2300 lines　　　(d) 318 lines

36. If the bit string 0111101111101111110 is subjected to bit stuffing for the flag string 01111110, the output string is

(a) 0111101111100111111010　　　(b) 0111101111101111111100

(c) 0111101111101111111010　　　(d) 0111101111101111110

44. The _____ measures the number of lost or garbled messages as a fraction of the total sent in the sampling period.
    (a) Residual Error rate
    (b) Transfer failure probability
    (c) Connection release failure probability
    (d) Connection establishment failure probability

45. In session layer, during data transfer, the data stream responsible for the `control` purpose (i.e. `control` of the session layer itself) is
    (a) regular data   (b) typed data   (c) capability data   (d) expedited data

The next three questions are based on Huffman's coding for the symbol A with probability 0.3, B with 0.15, C with 0.1, D with 0.25 and E with 0.2.

*46. The minimum number of bits required to represent B is
    (a) 1   (b) 2   (c) 3   (d) 4

*47. The minimum number of bits required to represent all the symbols together is
    (a) 14   (b) 11   (c) 12   (d) 15

*48. The average code length of the given problem is
    (a) 2   (b) 2.25   (c) 2.45   (d) 3

49. In cryptography, the following uses transposition ciphers and the keyword is LAYER. Encrypt the following message. (Spaces are omitted during encryption)

        WELCOME TO NETWORK SECURITY!

    (a) WMEKREETSILTWETCOOCYONRU!   (b) EETSICOOCYWMEKRONRU!LTWET
    (c) LTWETONRU!WMEKRCOOCYEETSI   (d) ONRU!COOCYLTWETEETSIWMEKR

50. Encrypt NEKEWNINRROGTTI using the above keyword in Transposition cipher method.
    (a) INTERWORKINGNET   (b) INTERNETWORKING
    (c) WORKINGINTERNET   (d) None of the above

51. Assuming that for a given network layer implementation, connection establishment overhead is 100 bytes and disconnection overhead is 28 bytes. What would be the minimum size of a packet the transport layer needs to keep up, if it wishes to implement a datagram service above the network layer and needs to keep its overhead to a maximum of 12.5%. (Ignore transport layer overhead.)
    (a) 512 bytes   (b) 768 bytes   (c) 1152 bytes   (d) 1024 bytes

52. Which of the following is not a standard RS-232C signal?
    (a) RTS   (b) CTS   (c) DSR   (d) VDR

53. A high speed communication equipment typically would not be needed for
    (a) E-mail
    (b) transferring large volume of data
    (c) supporting communication between nodes in a LAN
    (d) all of the above

54. Which of the following ISO level is more closely related to the physical communications facilities?
    (a) Application   (b) Session   (c) Network   (d) Data link

55. Which of the following is not a field in the Ethernet message packet?

    (a) Type   (b) Data   (c) Pin-code   (d) Address

56. The network topology that supports bi-directional links between each possible node is

    (a) ring   (b) star   (c) tree   (d) mesh

57. In a broad sense, a railway track is an example of

    (a) simplex   (b) half-duplex   (c) full-duplex   (d) all of the above

58. The frequency range at which the land coaxial cables will be used is

    (a) 10^6 to 10^8 Hz   (b) 10^{10} to 10^{11} Hz   (c) 10^3 to 10^4 Hz   (d) 10^{14} to 10^{15} Hz

59. If the data rate of ring is 20 Mbps, signal propagation speed is 200 m/μs, then the number of bits that can be placed on the channel of 200 km is

    (a) 2000 bits   (b) 20,000 bits   (c) 1,000 bits   (d) none of the above

60. ICI (interface control information) is

    (a) used to transfer user data from layer to layer

    (b) used to exchange information by peer entities at different sites on the network to instruct an entity to perform a service function

    (c) a combination of service data unit (SDU) and protocol control information (PCI)

    (d) a temporary parameter passed between N and $N - 1$ layers to involve service functions between two layers

61. Match the following

    1. Data link layer   (i) the lowest layer whose function is to activate, deactivate and maintain the circuit between DTE and, DCE

    2. Physical layer   (ii) performs routing and communication

    3. Presentation layer   (iii) detection and recovery from errors in the transmitted data

    4. Network layer   (iv) Provides for the syntax of the data

    (a) 1–(iii), 2–(i), 3–(iv),4–(ii)

    (b) 1–(ii), 2–(i), 3–(iv), 4–(iii)

    (c) 1–(iv), 2–(i), 3–(ii), 4–(iii)

    (d) 1–(ii), 2–(i), 3–(iii), 4–(iv)

Answers

1. a	2. d	3. b	4. d	5. d
6. c	7. c	8. b	9. b, c	10. c, d
11. a, b	12. a, c	13. a, b	14. a, c	15. c, d
16. a	17. b	18. b	19. c	20. a, d
21. a, b	22. a	23. b	24. c	25. a
26. b	27. b	28. b	29. c	30. c
31. b	32. b	33. b	34. c	35. a
36. a	37. b	38. a, b	39. b	40. c

41. d	42. a, b, d	43. b	44. a	45. c
46. c	47. c	48. b	49. b	50. b
51. d	52. d	53. a	54. d	55. c
56. d	57. b	58. a	59. b	60. d
61. a				

Explanations

9. In bipolar code the signal varies among three levels. In non-return to zero code the signal remains the same throughout the bit cell. In unipolar code, there will be no signal either below zero or above zero. In Manchester code, the signal level will not vary in the middle and is unipolar.

16. Start and stop bits are not needed in synchronous transfer of data. So, it is $2400/8 = 300$.

22. Bit stuffing is required when there is a flag of bits to represent one of the incidents, like start of frame, end of frame, etc., If the same flag of bits appear in the data stream, a zero can be inserted. The receiver deletes this zero from the data stream.

28. As all lines are full-duplex and there are no self connections, only the cross points above the diagonal are needed. Hence formula for the number of cross points needed is $n(n-1)/2$

29. Since there are six 1200 bps terminals, $6 \times 1200 + n \times 300 = 9600$. Solving, $n = 8$.

33. Maximum data rate $= 2H\log_2 V$ bps, where H is the bandwidth, V is the discrete levels. Here H is 3 kHz and V is 2.

34. Maximum number of the bps $= H\log_2 (1 + SNR)$.

35. In time division switches $2nT = 1$ frame period, where T is the memory access time.

46. The Huffman code for A will have 2 digits, B–3 digits, C–3 digits, D–2 digits and E–2 digits. This can be obtained by constructing the binary tree corresponding to the given probabilities.

47. Refer to the explanation of the previous question.

48. Average code length is the sum of product of the length and probability of the occurrence of the symbols. Here it is, $2 \times 0.3 + 3 \times 0.15 + 3 \times 0.1 + 2 \times 0.25 + 2 \times 0.2 = 2.25$.