



**POSTAL  
BOOK PACKAGE**

**2025**

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**COMPUTER  
SCIENCE & IT**

**Objective Practice Sets**

## **Computer Networks**

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# Networking Fundamentals and Physical Layer

## Multiple Choice Questions & NAT Questions

- Computer networks is
  - Collection of hardware components and computers
  - Interconnected by communication channels
  - Sharing of resources and information
  - All of the above
- Protocols are
  - Agreements on how communication components and DTE's are to communicate.
  - Logical communication channels used for transferring data.
  - Physical communication channels used for transferring data.
  - None of the above
- Match the following groups based on layer of OSI model.
 

<b>Group-1</b>	<b>Group-2</b>
<b>A.</b> Hub	<b>1.</b> Physical layer
<b>B.</b> Bridge	<b>2.</b> Data link layer
<b>C.</b> Router	<b>3.</b> Network layer
<b>D.</b> Server	<b>4.</b> Application layer

**Codes:**

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(a) 1	2	3	4
(b) 2	2	3	3
(c) 2	3	3	3
(d) 1	3	3	4
- Match the following groups:
 

<b>Group-1</b>	<b>Group-2</b>
<b>A.</b> Link	<b>1.</b> Message
<b>B.</b> Network	<b>2.</b> Segment
<b>C.</b> Application	<b>3.</b> Datagram
<b>D.</b> Transport	<b>4.</b> Frame

**Codes:**

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(a) 3	4	2	1
(b) 4	3	2	1
(c) 4	3	1	2
(d) 3	4	1	2
- Match **List-I** with **List-II** and select the correct answer using the codes given below the lists:
 

<b>List-I</b>	<b>List-II</b>
<b>A.</b> Session layer	<b>1.</b> Connects DCE into physical channel.
<b>B.</b> Transport layer	<b>2.</b> Provides end to end connectivity.
<b>C.</b> Application layer	<b>3.</b> Provides organized means to exchange data between users. (Like synchronization points).
<b>D.</b> MDI (Medium Dependent Interface)	<b>4.</b> Supports an end user process and performs required file transfer.

**Codes:**

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(a) 3	4	2	1
(b) 3	2	4	1
(c) 2	4	1	3
(d) 4	3	2	1
- Match the following:
 

<b>List-I</b>	<b>List-II</b>
<b>A.</b> Data link layer	<b>1.</b> The lowest layer whose function is to activate, deactivate and maintain the circuit between DTE and DCE.
<b>B.</b> Physical layer	<b>2.</b> Performs routing and communication.
<b>C.</b> Presentation layer	<b>3.</b> Detection and recovery from errors in the transmitted data.
<b>D.</b> Network layer	<b>4.</b> Concerned with for the syntax of the data.

**Codes:**

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(a) 3	1	4	2
(b) 2	1	4	3
(c) 4	1	2	3
(d) 2	1	3	4

7. Which of the following OSI level is more closely related to the physical communications facilities?  
(a) Application (b) Session  
(c) Network (d) Data link
8. Which of the following connectivity devices typically work at the physical layer of the OSI model?  
(a) Routers (b) Bridges  
(c) Repeaters (d) Gateways
9. The method of communication in which transmission takes place in both directions, but only in one directions at a time is called  
(a) Simplex (b) Four wire circuit  
(c) Full duplex (d) Half duplex
10. In a broad sense, a railway track is an example of  
(a) Simplex (b) Half-duplex  
(c) Full-duplex (d) All of these
11. Which of the following is not true?  
(a) Ring topology of N-devices contains (N – 1) dropline and N-Ring cables.  
(b) Bus topology of N-devices needs 1 dropline and N-Backbone cables.  
(c) Star topology of N-devices contains N + 1 links and N-ports.  
(d) All of these
12. A network that requires human intervention to route signals is called a  
(a) Bus network (b) Ring network  
(c) Star network (d) T-switched network
13. Match the following cables with there bandwidth
- | <b>List-I</b>    | <b>List-II</b>      |
|------------------|---------------------|
| I. Coaxial cable | A. 4 Mbps to 1 Gbps |
| II. UTP          | B. 10 Gbps          |
| III. STP         | C. 10 Mbps          |
| IV. Fiber optic  | D. 10 to 100 Mbps   |
- (a) I - B, II - D, III - A, IV - C  
(b) I - C, II - A, III - D, IV - B  
(c) I - C, II - D, III - B, IV - C  
(d) I - B, II - A, III - D, IV - B
14. Baseband is  
(a) Transmission of signals without modulation.  
(b) A signal all of whose energy is contained within a finite frequency range is finite but near to zero.  
(c) The simultaneous transmission of data to a number of stations.  
(d) All of the above
15. Broad band uses  
(a) Manchester encoding  
(b) FSK encoding  
(c) ASK encoding  
(d) PSK encoding
16. Baud means the  
(a) Number of bits transfer per unit time  
(b) Number of bytes transmitted per unit time  
(c) Rate at which the signal changes  
(d) None of these
17. The effective bandwidth is based on \_\_\_\_\_.  
(a) Average data rate  
(b) Peak data rate  
(c) Maximum burst size  
(d) All of the above
18. Choose the correct statements(s):  
(a) Baseband network uses analog technology.  
(b) Baseband network is Time Division Multiplexed.  
(c) Broadband network uses digital technology.  
(d) In broadband network, the carrier signals operate at lower frequency.
19. A device that can convert digital signals to analog signals is (only in networking)  
(a) An emulator (b) A packet  
(c) A modem (d) None of these
20. When a signal travels through a transmission medium, its power becomes 100 times. Then there power would be  
(a) Loss of 100 (b) Loss of 20 dB  
(c) Gain of 100 (d) Gain of 20 dB
21. There are three IP addresses as given below:  
X = 202.23.14.150  
Y = 168.19.200.12  
Z = 72.192.52.210  
Which of the following statements is/are correct?  
(a) X is Class A, Y is Class B and Z is Class C  
(b) X is Class C, Y is Class A and Z is Class B  
(c) X is Class C, Y is Class B and Z is Class A  
(d) X is Class A, Y is Class C and Z is Class B

**Answers Networking Fundamentals and Physical Layer**

1. (d) 2. (a) 3. (a) 4. (c) 5. (b) 6. (a) 7. (d) 8. (c) 9. (d)  
 10. (b) 11. (d) 12. (d) 13. (b) 14. (a) 15. (d) 16. (c) 17. (d) 18. (b)  
 19. (b) 20. (d) 21. (c) 22. (b) 23. (b) 24. (c) 25. (c) 26. (b) 27. (c)  
 28. (b) 29. (d) 30. (a) 31. (c) 32. (255) 33. (c) 34. (d) 35. (b) 36. (b)  
 37. (d) 38. (b) 39. (d) 40. (222) 41. (a) 42. (b) 43. (b) 44. (c) 45. (c)  
 46. (a) 47. (b) 48. (252 and 0) 49. (d) 50. (a) 51. (a) 52. (c) 53. (d)  
 54. (c) 55. (c) 56. (c) 57. (c) 58. (d) 59. (d) 60. (b) 61. (16) 62. (39.8)  
 63. (a) 64. (c) 65. (c) 66. (d) 67. (c) 68. (a) 69. (c) 70. (b) 71. (b)  
 72. (b) 73. (c) 74. (a) 75. (33) 76. (c) 77. (c) 78. (b) 79. (a) 80. (1)  
 81. (2) 82. (b) 83. (a) 84. (14) 85. (d) 86. (c) 87. (62) 88. (c) 89. (d)  
 90. (c) 91. (a) 92. (64) 93. (a) 94. (c) 95. (d) 96. (b) 97. (a) 98. (a)  
 99. (d) 100. (320) 101. (111) 102. (a, b, c, d) 103. (b, c) 104. (a, c) 105. (b, c) 106. (a, b)  
 107. (a, b) 108. (a, c, d) 109. (a, b, d) 110. (a, b) 111. (c, d) 112. (b, c)

**Explanations Networking Fundamentals and Physical Layer****2. (a)**

Protocols is a set of rules. It is an agreement between the communicating parties on how communication should proceed.

**3. (a)**

Hub works in physical layer  
 Bridge works in data link layer  
 Router works in network layer  
 PC, Server works in application layer.

**4. (c)**

Link layer unit of data is frame  
 Network layer unit of data is datagram  
 Application layer unit of data is message  
 Transport layer unit of data is segment  
**Note:** Network layer can use the term packet if communication is reliable (via TCP).

**5. (b)**

- Session layer provide organised means to exchange data between uses.
- Layer support an end user process and performs required file transfer.
- Transport layer provides end to end connectivity.
- Medium dependent interface connects DCE into physical channel.

**6. (a)**

**Data link layer:** It is associated with the detection and recovery from the errors in the transmitted data.

**Physical layer:** It is the lowest layer whose function is to activate, deactivate and maintain the circuit between Data Terminal Equipment (DTE).

**Presentation layer:** It is concerned with the syntax and semantics of the information exchanged between two systems.

**Network layer:** This layer has some specific responsibilities:

- Logical addressing [communication]
- Routing

**7. (d)**

OSI model layer division is as application layer, session layer, transport layer, network layer, data-link layer, physical layer. Hence the ISO level which is more closely related to the physical communication facilities is data link layer among other given layers.

**8. (c)**

Router — network layer  
 Bridges — data link layer

Repeater — physical layer  
Gateways — application layer

**9. (d)**

In simplex mode, transmission takes place in one direction.

In duplex mode, transmission take place simultaneously in both direction.

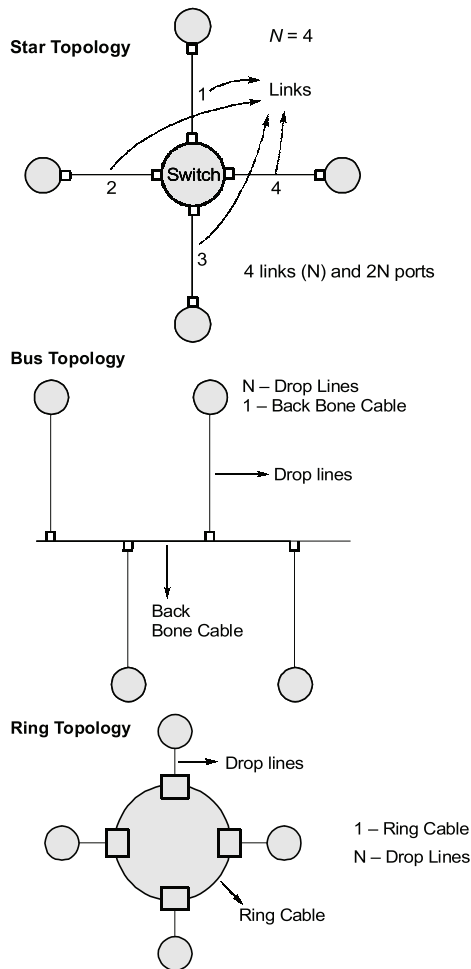
In half-duplex transmission take place in both direction but not at the same time.

**10. (b)**

In half duplex mode the transmission is takes place in both direction, but only in one direction at a time.

Hence, railway track is an example of this half-duplex mode.

**11. (d)**



**12. (d)**

T-switched network requires human intervention to route signals.

**13. (b)**

Coaxial : 10 Mbps  
UTP : 4 Mbps to 1 Gbps  
STP : 10 to 100 Gbps  
Fiber optic : 10 Gbps

**14. (a)**

Baseband is a signal that has a very narrow and near zero frequency range. Baseband can be synonymous with low pass or non-modulated. In broadband simultaneous transmission of data to a number of station possible but not in baseband.

**15. (d)**

Broad band uses phase shift key encoding technique.

**16. (c)**

Baud rate is the number of signals units per second that are required to represents the bits transmitted during one second.

**17. (d)**

The effective data burst is a measure of average data rate, peak data rate and maximum data rate.

**18. (b)**

Baseband transmission typically use digital signalling over a single wire. Using this, it is possible to transmit multiple signals on a single cable by time-division multiplexing. In broadband transmission multiple channels are created using frequency-division multiplexing.

**19. (b)**

Modem stands for modulator/demodulator. Modulator converts a digital signals into an analog signal using ASK, FSK, PSK or QAM. Demodulator converts an analog signal into digital signal.

**20. (d)**

$$\text{Formulated at amplification} = 10 \log_{10} \frac{P_2}{P_1} \text{ dB}$$

$$\text{Here, } P_2 = 100 P_1$$

$$\therefore \text{ Amplification} = 10 \log_{10} \frac{100P_1}{P_1} \text{ dB}$$

$$= 10 \log_{10} 10^2 = 20 \text{ dB}$$

Here, value is +ve. Hence gain at 20 dB

## Data Link Layer

## Multiple Choice Questions &amp; NAT Questions

1. Which of the following statement is FALSE?
  - (a) In Ethernet, each node's physical address is guaranteed to be globally unique.
  - (b) The single parity check can detect any odd number of bit errors in a transmitted codeword.
  - (c) In Ethernet, a node wishing to transmit might never be allowed to access the channel.
  - (d) None of these
2. In P-persistent CSMA network there are 5 systems in a slot. The probability of station not transmitting the data is 0.6. Only two stations should transmit the data to avoid collision. What is the probability that channel is collision free?
3. In some types of networks, a special packet called the token is used to guarantee access to the network media which of the following network can not use this method?
  - (a) ARC net                      (b) FDDI
  - (c) ATM                            (d) Token ring
4. What is the main purpose of a data link content monitor?
  - (a) To determine the type of transmission used in data link.
  - (b) To determine the type of switching used in data link.
  - (c) To detect problems in protocol.
  - (d) To determine the flow of data.
5. In a data link protocol, the following character encoding is used :  
 A → 01000111; B → 11100011, Flag → 01111110, ESC → 11100000  
  
 Assuming that byte styling is employed for the four character frame AB ESC Flag, Transmitter sends it as
  - (a) 01111110 01000111 11100011 11100000 11100000 01111110
  - (b) 01111110 01000111 11100011 11100000 11100000 01111110 01111110 01111110
  - (c) 01111110 01000111 11100011 11100000 11100000 01111110 01111110 01111110
  - (d) None of these
6. One of your classmate Achint Chaudhary has pointed out that it is wasteful to end each frame with a flag byte and then begin the next one with a second flag byte. One flag byte could do the job as well, and a byte saved is a byte saved is a byte earned.
  - (a) Its difficult to distinguish between two frames separated by a time gap.
  - (b) Its easy to distinguish between two frames separated by time gap.
  - (c) Both of the reason
  - (d) None of the reason
7. Bit stuffing refers to
  - (a) Inserting a '0' in user stream to differentiate it with a flag
  - (b) Inserting a '0' in flag stream to avoid ambiguity
  - (c) Appending a nibble to the flag sequence
  - (d) Appending a nibble to the use data stream
8. In a data link protocol the frame delimiter flag is given by 0111. Assuming that bit stuffing is employed the transmitter sends the data sequence 0111 0110 as :
  - (a) 0110 1011 10            (b) 0110 1011 00
  - (c) 0111 0110 00            (d) 0110 1011 00
9. A bit stuffing based framing protocol used an 8-bit delimiter pattern of 01111110. If the output bit string after stuffing is 01111100101, then the input bit-string is
  - (a) 0111110101            (b) 0111110100
  - (c) 0111111111            (d) 0111111101
10. Which of the following indicates the increasing order of accuracy in error detection?
  - (a) CRC, Single Parity, Block Sum Check
  - (b) Block Sum Check, CRC, Single Parity

- (c) Single Parity, Block sum Check, CRC  
(d) CRC, Block Sum Check, Single Parity
11. Which error detection method consists of a parity bit for each data unit as well as an entire data unit of parity bits?  
(a) Simply parity check  
(b) Two-dimensional parity check  
(c) CRC  
(d) Checksum
12. Consider a parity check code with three data bits and four parity check bits. Three of the code words are 0101011, 1001101 and 1110001.  
Which of the following are also code words?  
I. 0010111      II. 0110110  
III. 1011010     IV. 0111010  
(a) I and III      (b) I, II and III  
(c) II and IV      (d) I, II, III and IV
13. Consider the following statements:  
**Statement 1** : The single parity check can detect any odd number of bit errors in a transmitted codeword.  
**Statement 2** : To correct  $d$  errors, there must be ' $d + 1$ ' hamming distance.  
Which of following is true?  
(a) Only Statement 1 is correct  
(b) Only Statement 2 is correct  
(c) Both are correct  
(d) None of these
14. An Ethernet hub  
(a) functions as a repeater  
(b) connects to a digital PBX  
(c) connects to a token-ring network  
(d) functions as a gateway
15. Vertical Redundancy Check (VRC) is method of  
(a) Error Detection  
(b) Error Correction  
(c) Modified Receiver Data  
(d) To detect packets number
16. Error detection at the data link layer is achieved by  
(a) Bit Stuffing  
(b) Hamming codes  
(c) Cyclic Redundancy codes  
(d) Equalization
17. Given a message "1010001101" and CRC error detecting code uses the polynomial  $x^5 + x^4 + x^2 + 1$ . Find the transmitted message using CRC?  
(a) 101000110101011 (b) 101000110101101  
(c) 101000110101110 (d) 101000110111111
18. The message 100100 is to be transmitted by taking the CRC polynomial  $x^3 + x^2 + 1$  to protect it from errors. What must be the message to be send after appending the CRC to the message?  
(a) 100100000 (b) 100100001  
(c) 100100110 (d) 100100111
19. In CRC if the data unit is 100111001 and the divisor is 1011 then what is dividend at the receiver?  
(a) 100111001101 (b) 100111001011  
(c) 100111001 (d) 100111001110
20. CRC can detect all bursts of upto  $m$  errors, if generator polynomial  $G(x)$  is of degree  
(a) One (b)  $m - 1$   
(c)  $m$  (d)  $m + 1$
21. The reference polynomial used in a CRC scheme is  $x^4 + x^3 + 1$ . A data sequence 1010101010 is to be sent. Determine the actual bit string that is transmitted.  
(a) 10101010100010 (b) 10101010100110  
(c) 10101010101110 (d) 10101010100011
22. The message 11001001 is to be transmitted using the CRC polynomial  $x^3 + 1$  to protect it from errors. The message that should be transmitted is:  
(a) 11001001000 (b) 11001001011  
(c) 11001010 (d) 110010010011
23. A computer network uses polynomials over GF(2) for error checking with 8 bits as information bits and uses  $x^3 + x + 1$  as the generator polynomial to generate the check bits. In this network, the message 01011011 is transmitted as  
(a) 01011011100 (b) 01011011101  
(c) 01011011011 (d) 01011011010
24. Let  $g(x) = x^3 + x^2 + 1$ . Consider the information bits (1, 1, 0, 1, 1, 0). Find the codeword corresponding to these information bits if  $g(x)$  is used as the generating polynomial.  
(a) 110110111 (b) 110110110  
(c) 110110100 (d) 110110101



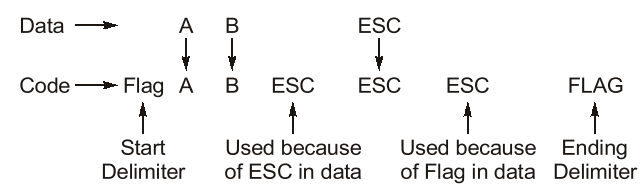
**Answers Data Link Layer**

1. (d) 2. (0.3456) 3. (c) 4. (c) 5. (c) 6. (a) 7. (a) 8. (b) 9. (a)  
 10. (c) 11. (b) 12. (a) 13. (a) 14. (a) 15. (a) 16. (c) 17. (c) 18. (b)  
 19. (b) 20. (c) 21. (a) 22. (b) 23. (b) 24. (a) 25. (1100) 26. (b) 27. (c)  
 28. (4) 29. (a) 30. (240) 31. (d) 32. (c) 33. (300) 34. (d) 35. (c) 36. (d)  
 37. (a) 38. (d) 39. (c) 40. (b) 41. (d) 42. (c) 43. (a) 44. (c) 45. (b)  
 46. (12) 47. (c) 48. (b) 49. (c) 50. (d) 51. (b) 52. (b) 53. (a) 54. (c)  
 55. (31) 56. (b) 57. (3.5) 58. (a) 59. (a) 60. (0.0017) 61. (270) 62. (a)  
 63. (0.3456) 64. (d) 65. (500) 66. (d) 67. (500) 68. (d) 69. (d) 70. (512)  
 71. (1000) 72. (d) 73. (a) 74. (a) 75. (c) 76. (d) 77. (b) 78. (b)  
 79. (a) 80. (b) 81. (c) 82. (d) 83. (0.198) 84. (b) 85. (b) 86. (b)  
 87. (c) 88. (a) 89. (d) 90. (d) 91. (b) 92. (d) 93. (c) 94. (c) 95. (d)  
 96. (c) 97. (b) 98. (a) 99. (c) 100. (c) 101. (c) 102. (a) 103. (c) 104. (2)  
 105. (88) 106. (d) 107. (d) 108. (d) 109. (b) 110. (b) 111. (d) 112. (b)  
 113. (114.64) 114. (d) 115. (b) 116. (31) 117. (c) 118. (120.80) 119. (b) 120. (c)  
 121. (1030) 122. (a) 123. (0.2) 124. (c) 125. (b) 126. (c) 127. (d) 128. (a)  
 129. (b, c, d) 130. (a, b, d) 131. (a, c, d) 132. (a, c) 133. (a, b) 134. (a, c, d)  
 135. (a, b) 136. (a, d) 137. (a, b, c) 138. (a, c) 139. (a, c) 140. (b, c)  
 141. (a, b, c) 142. (c, d) 143. (a, d) 144. (a, c) 145. (b, c)

**Explanations Data Link Layer**

- 1. (d)**  
Option (a), (b) and (c) are true statements.
- 2. (0.3456)**  
 $P$  (of 2 stations)  
 $= 5C_2 \times P_{(\text{transmitting})}^2 \times P_{(\text{not transmitting})}^3$   
 $= 5C_2 (0.4)^2 (0.6)^3$   
 $= 10 \times 0.16 \times 0.216 = 0.3456$
- 3. (c)**  
Asynchronous Transfer Mode (ATM) is a telecommunication concept for carriage of a compute range of user traffic, including voice, data and video signals. It was designed for a network that must handle both traditions high throughput data traffic and real time, low-latency context such as voice and video.
- 4. (c)**  
To detects problems in protocol.

- 5. (c)**  
Under byte stuffing flag bits are used as starting and ending delimiters. Apart from this if the code for flag is there in the data, ESC character is used with the flag. If 'ESC' is also there in the code then one more 'ESC' character used.  
So,



- 6. (a)**  
It is difficult to distinguish between two frames separated by a time gap, whether it is garbage data or actual next frame (first frame ends with FLAG bytes).



7. (a)

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.

8. (b)

Input = 0111 0110 with flag = 0111  
So, stuffing data = 0110101100

9. (a)

Input string : 0111110101  
Output string : 01111100101  
After first consecutive 1's in the input, bit 0 is inserted.

10. (c)

Single parity can detect single bit error, while block sum check can more than one bit error and CRC can detect all errors present in data.  
So, single parity < Block sum check < CRC.

11. (b)

Two dimensional parity check consist parity bits for each data unit as well as an entire data unit of parity bits.

12. (a)

Consider first 3 bits  $x_1, x_2$  and  $x_3$  are data bits and last 4 bits  $c_1, c_2, c_3$  and  $c_4$  are parity check bits i.e., 0101011 will be  $x_1(0), x_2(1), x_3(0), c_1(1), c_2(0), c_3(1)$  and  $c_4(1)$ .

By analyzing pattern used to create parity bits i.e., here

	$x_1$	$x_2$	$x_3$	$c_1=x_1 \oplus x_2$	$c_2=x_1 \oplus x_3$	$c_3=x_2 \oplus x_3$	$c_4=x_1 \oplus x_2 \oplus x_3$
1.	0	1	0	1	0	1	1
2.	1	0	0	1	1	0	1
3.	1	1	1	0	0	0	1

So by applying same rule to find other code words.

	$x_1$	$x_2$	$x_3$	$c_1=x_1 \oplus x_2$	$c_2=x_1 \oplus x_3$	$c_3=x_2 \oplus x_3$	$c_4=x_1 \oplus x_2 \oplus x_3$
4.	0	0	1	0	1	1	1
5.	0	1	1	1 ≠ 0 so fail			
6.	1	0	1	1	0	1	0
7.	0	1	1	1	1 ≠ 0 so fail		

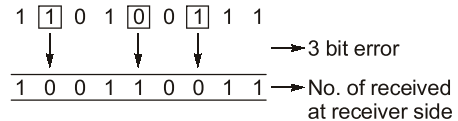
So only I<sup>st</sup> and III<sup>rd</sup> are code word.

13. (a)

In single parity, a single bit either 0 or 1 is added at the end to the transmitted number of such that total number of 1's in transmitted codeword will be even.

$$\begin{array}{c} \underline{11010011} + 0/1 \rightarrow \underline{110100111} \\ \text{Transmitted} \quad \quad \quad \text{Transmitted} \\ \text{Number} \quad \quad \quad \text{Codeword} \end{array}$$

If we assume odd number of bit errors, i.e., 1/3/5 or 7 bit errors. So number of 1's in transmitted codeword will change by an odd number only. Since, destination computer is expecting number of 1's to be even, it will detect there was some error during transmission.



Total number of 1's = 5 = odd number of 1's.

14. (a)

An ethernet hub functions as a repeater. In telecommunications, a repeater is an electronic device that receives a signal and retransmits it at a higher level or a higher power.

15. (a)

VRC is also called parity check. In this, a redundant bit, called parity bit, is appended to every data unit so that total number of 1's in unit becomes even (including the parity bit).

16. (c)

Error detection at data link layer is achieved by CRC.

17. (c)

$$M = 1010001101$$

$$P = x^5 + x^4 + x^2 + 1 = 110101$$

$$\begin{array}{r} 110101 \Big) 1010001101 \ 00000 \left( 1101010110 \right. \\ \underline{110101} \phantom{00000} \\ 111011 \phantom{00000} \\ \underline{110101} \phantom{00000} \\ 111010 \phantom{00000} \\ \underline{110101} \phantom{00000} \\ 111110 \phantom{00000} \\ \underline{110101} \phantom{00000} \\ 101100 \phantom{00000} \\ \underline{110101} \phantom{00000} \\ 110010 \phantom{00000} \\ \underline{110101} \phantom{00000} \\ 01110 \phantom{00000} \end{array}$$

$$\text{CRC} = 01110$$

$$\text{Transmitted message} = 101000110101110$$

## Network Layer

## Multiple Choice Questions &amp; NAT Questions

1. The best effort delivery services such as an IP does not include
  - (a) error checking
  - (b) datagram acknowledgment
  - (c) error correction
  - (d) All of the above
2. The frame relay committed information rate represents
  - (a) Maximum data rate on the network
  - (b) Steady state data rate on the network
  - (c) Minimum data rate on the network
  - (d) Interface data rate
3. An example of a network layer is
  - (a) Internet Protocol (IP)-ARPANET
  - (b) X.25 Packet Level Protocol (PLP)-ISO
  - (c) Source routing and domain naming-USENET
  - (d) All of these
4. During normal IP packet forwarding by routers which of the following packet fields are updated?
  - (a) IP header source address
  - (b) IP header destination address
  - (c) IP header TTL
  - (d) IP header check sum
5. One of the header fields in an IP datagram is the time to live (TTL) field. Which of following statements best explains the need for this field?
  - (a) It can be used to reduce delays.
  - (b) It can be used to optimize throughput.
  - (c) It can be used to prevent packet looping.
  - (d) It can be used to prioritize packets.
6. Which one of the following fields of an IP header is modified by typical IP router?
  - I. Checksum
  - II. Source address
  - III. Length
  - IV. Time to live (TTL)
7. Which of the following assertions is TRUE about Internet Protocol (IP)? Choose correct options:
 

$S_1$  : It is possible for a computer to have multiple IP addresses.

$S_2$  : IP packets from same source to the same destination can take different routes in the network.

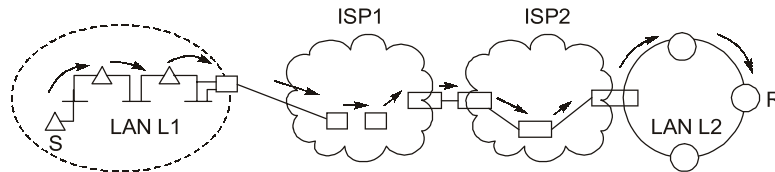
$S_3$  : The packet source can set the route of an outgoing packets; the route is determined only by the routing tables in the routers on the way.

$S_4$  : IP ensures that a packet is forwarded if it is unable to reach its destination with in a given number of hops.

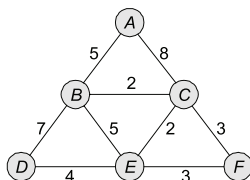
Which of the following is true?

  - (a) Only  $S_1$
  - (b) Only  $S_2$  and  $S_3$
  - (c) Only  $S_1$ ,  $S_2$  and  $S_3$
  - (d) All of the above
8. In TCP/IP protocol suite, which one of the following is not part of the IP header?
  - (a) Fragment offset
  - (b) Destination IP address
  - (c) Source IP address
  - (d) Destination port address
9. Which of the statement is true?
  - (a) Ethernet frame includes a CRC field and IP packet includes a checksum field.
  - (b) Fragment offset is not part of IP header.
  - (c) Source address is modified by typical IP router.
  - (d) TTL not prevent packet looping.

10. In the diagram shown below,  $L_1$  is an ethernet LAN and  $L_2$  is a token ring LAN. An IP packet originates from sender  $S$  and traverses to  $R$  as shown. The links within each ISP and across two ISP's, are all point-to-point optical links. The initial value of TTL field is 32. The maximum possible value of the TTL field when  $R$  receives the datagram is \_\_\_\_\_.



11. The maximum number of IPv4 router addresses that can be listed in the record route (RR) option field of an IPv4 header is \_\_\_\_\_.
12. The best effort delivery services such as on IP does not include  
 (a) Error correction  
 (b) Error checking  
 (c) Datagram acknowledged  
 (d) All of these
13. Consider the following statements with respect to routing protocols:  
 $S_1$  : Path vector routing assumes that there is one node in each autonomous system that acts on behalf of the entire autonomous system.  
 $S_2$  : OSPF is based on link state routing protocol.  
 $S_3$  : In distance vector routing, each node periodically shares its routing table with its neighbour and whenever there is a change.  
 $S_4$  : Distance vector is an intra domain routing protocol, whereas path vector is an inter domain routing protocol.  
 $S_5$  : Link state routing does not use Dijkstra's algorithm to build routing tables.
- Which of the above statements are correct?  
 (a) Only  $S_1$  and  $S_3$   
 (b) Only  $S_1$ ,  $S_2$ ,  $S_3$  and  $S_4$   
 (c) Only  $S_4$  and  $S_5$   
 (d) Only  $S_1$ ,  $S_3$  and  $S_4$
14. Consider the network shown in the following graph with nodes and links along with costs.



- Initially node  $B$ 's routing table contains only one entry, for itself. When  $B$  runs Dijkstra's algorithm, which of the following is not a correct order of nodes added to the routing table?  
 (a)  $B, C, E, A, F, D$       (b)  $B, C, E, D, A, F$   
 (c)  $B, C, E, F, A, D$       (d) None of these
15. Who can send ICMP error-reporting messages?  
 (a) Routers  
 (b) Destination hosts  
 (c) Source host  
 (d) Both (a) and (d)
16. ICMP (Internet Control Message) Protocol is  
 (a) A protocol used to dynamically bind a high level IP Address to a low-level physical hardware address.  
 (b) A protocol for transferring files from one machine to another.  
 (c) A protocol used to monitor computers.  
 (d) A protocol that handles error and control messages.
17. ARP (Address resolution protocol) is  
 (a) A protocol used to dynamically bind IP address to a low-level physical hardware address.  
 (b) A high level protocol for transferring files from one machine to another.  
 (c) A protocol used to monitor computers.  
 (d) A protocol that handles error and control messages.
18. Which one of the following protocols is NOT used to resolve one form of address to another one?  
 (a) DNS      (b) ARP  
 (c) DHCP      (d) RARP
19. Which of the following type of ICMP messages need to be encapsulated into an IP datagram?  
 (a) Time exceeded      (b) Multicasting  
 (c) Echo reply      (d) All of these

**Answers** **Network Layer**

1. (d) 2. (c) 3. (d) 4. (c) 5. (c) 6. (c) 7. (d) 8. (d) 9. (a)  
 10. (24) 11. (36) 12. (d) 13. (b) 14. (b) 15. (d) 16. (d) 17. (a) 18. (a)  
 19. (d) 20. (c) 21. (c) 22. (d) 23. (d) 24. (c) 25. (a) 26. (d) 27. (b)  
 28. (a) 29. (b) 30. (c) 31. (c) 32. (a) 33. (c) 34. (a) 35. (c) 36. (d)  
 37. (d) 38. (a) 39. (c) 40. (c) 41. (13) 42. (b) 43. (c) 44. (c) 45. (b)  
 46. (b) 47. (d) 48. (d) 49. (a) 50. (d) 51. (d) 52. (2) 53. (c) 54. (b)  
 55. (d) 56. (d) 57. (b) 58. (c) 59. (c) 60. (262.14) 61. (a) 62. (a) 63. (1440)  
 64. (a) 65. (81.8) 66. (23) 67. (40) 68. (2140) 69. (113.175) 70. (a) 71. (a)  
 72. (8.738) 73. (2740) 74. (b) 75. (d) 76. (a) 77. (a) 78. (c) 79. (a)  
 80. (b) 81. (a) 82. (c) 83. (c, d) 84. (c, d) 85. (a, b, c) 86. (a, b)  
 87. (b, d) 88. (a, c) 89. (a, b) 90. (a, d) 91. (a, b, c) 92. (a, c, d) 93. (a, c)

**Explanations** **Network Layer****1. (d)**

**Option (a):** Error Checking is only for header part.

**Option (b):** There is no acknowledgment for packets reaching the destination.

**Option (c):** IP has minimal error control and there is no concept of error correction for IP datagram. All the options are correct.

**2. (c)**

Frame relay committed information rate represents minimum data rate on the network.

$$\text{CIR} = B_c / T \text{ bps} \quad T \rightarrow \text{time period}$$

Here cumulative number of bits sent during the predefined period should not exceed  $B_c$ .

**3. (d)**

Internet protocol (IP-ARPA NET, X.25 packet level protocol-ISO and source routing and domain naming-USENET are example of network layer.

**4. (c)**

During forwarding of an IP packet by routers, the packet fields namely IP header source address and IP header destination address remains same whereas check own and TTL are updated.

**5. (c)**

In the IP datagram there is time to time (TTL) files. It is mainly uses to previous packet looping.

Means every packet is associated with certain time stamp. If one packet is received after certain time stamp (TTL) then this packet discarded so it can be used to prevent packet looping.

**6. (c)**

Checksum, length and TTL are modified by IP address.

**7. (d)**

All of above statements are true.

**Choice (a):** It is possible for a computer to have multiple IP addresses - IP addresses specify the n/w connection not to host computer so if a host computer moves from one network to another. Its IP address must change. In the network the IP address for a computer is unique but when we move the host computers from one network to another network, its IP address must be changed.

**Choice (b):** IP packets from the same source to same destination can take different routes in the network. In packet switching network thee routes are determined by routing algorithms. It may be possible that different networks follows different routing algorithms so that statement is true.

**Choice (c):** The usual IP routing algorithm employs an internet routing table on each machine (computer) that sources informations about possible destination and how to reach them.

Because both hosts (computer) and routers route datagrams both have IP routing tables so statement true.

**Choice (d):** Statement is true.

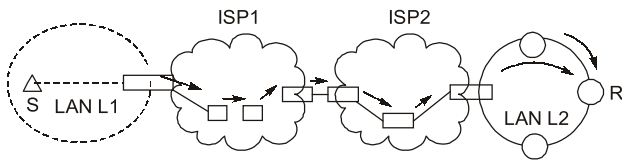
**8. (d)**

Destination port number is not present in IP header. Because the IP header has nothing to do with port number. Port number are used by the transport layer to ensure process to process delivery.

**9. (a)**

Ethernet uses a CRC algorithm to detect transmission errors. The IP and most higher layer protocols of the internet protocol suite (ICMP, IGMP, UDP, UDP - Lite, TCP) use a common checksum algorithm to validate the integrity of the packets that they exchange.

**10. (24)**



$32 - 8 = 24$  is maximum value of TTL.

**11. (36)**

In IPv4, options and padding 40 bytes are allowed. Maximum nine routers addresses are allowed. Each IPv4 address is 32 bits or 4 bytes  
So  $4 \times 9 = 36$  bytes  
Extra bytes are used for the option.

**12. (d)**

- IP has minimal error control and there is no concept of error correction for IP datagram.
- Error checking is only for header part.
- There is no acknowledgment for packets reaching the destination.

**13. (b)**

Statement  $S_1$ ,  $S_2$ ,  $S_3$  and  $S_4$  are correct but  $S_5$  not correct.

Link state routing uses Dijkstra's algorithm to build routing tables.

**14. (b)**

$B$  to  $A$  link cost is 5 [shortest]  
 $B$  to  $F$  link cost is 5 [shortest]

After  $B$ ,  $C$ ,  $E$  visits, next node is either  $A$  or  $F$  but  $B$  to  $D$  link cost is 7 [shortest]  $B$ ,  $C$ ,  $E$ ,  $A$ ,  $F$ ,  $D$ .

**OR**

$B$ ,  $C$ ,  $E$ ,  $F$ ,  $A$ ,  $D$

$\therefore$  Option (b) cannot be the order of nodes added to the routing table at  $B$ .

**15. (d)**

Both router and destination host can send ICMP error-reporting message to inform the source host about any failure or error occurred in packet.

**16. (d)**

Internet control message protocol (ICMP) is a mechanism used by hosts and routers to send notification of datagram problems back to the sender. ICMP tests whether a destination is reachable and responding. It handles both control and error messages.

[Note: The function of ICMP is to report problems not correct them.]

**17. (a)**

ARP associates on IP addresses with the physical address. ARP is used to find the physical address of the node when internet address is known.

**18. (a)**

- DNS is used for mapping host name to IP address.
- ARP is address resolution protocol used to map IP address with MAC address.
- RARP is reverse address resolution protocol used to map MAC address with IP address.
- DHCP is also used to map MAC address with IP address.

Since all options are used to find one address to another address but option (c) is most appropriate answer.

**19. (d)**

Time exceeded; echo reply and multi-casting ICMP messages needs to be encapsulated into if data gram to the sender side.

**20. (c)**

Machine connected to the internet may use the ARP when it want to use the data link layer.

**21. (c)**

$S_2$  is false because ethernet frame has CRC field and IPv4 packet includes checksum field.