

TRUE

23. A cookie may contain up to five fields, one of them is security.

TRUE

24. SLIP and PPP do not provide any form of authentication.

False

25. In a datagram subnet, the route is chosen only when the connection is established.

False

26. In 802.11 LAN, if station X received RTS, but did not receive CTS, then X can transmit its data and will not interfere with other stations.

True

27. The basic function of RTP is to multiplex several real-time data streams onto UDP packets.

True

28. The base64 encoding can be used for converting a non-ASCII email to an ASCII email, which operates by breaking three 8-bit bytes into four 6-bit bytes.

True

29. PGP (Petty Good Privacy) encrypts data by using a block cipher called AES.

False

30. Large amounts of secret data are normally encrypted using secret-key (session key) cryptography, although public-key cryptograph (such as RSA), is widely used for the authentication protocol and for establish the session key.

True

二、 Please select the best choice for following questions, and fill the answer into the table *(50 points)*

101. The PDU for the transport layer of TCP/IP is also called \_\_\_\_\_.

- A.) packet
- B.) frame
- C.) bit
- D.) segment

102. There are two types of transmission technology that are in widespread use. They are as follows:

- A.) Broadcast links and point-to-point links.
- B.) Ethernet and X.25.
- C.) Ethernet and token ring.
- D.) End-to-end links and point-to-point links.

103. Wireless networks can be divided into three main categories: system interconnection, \_\_\_\_\_.

- A.) Bluetooth and 802.11.
- B.) Bluetooth and 802.16

- C.) wireless LANs and wireless WANs.
- D.) 802.5 and 802.11.

104. Which of the following statements best describes a MAN?

- A.) It connects LANs that are separated by a large geographic area such as several cities.
- B.) It is a privately-owned network within a single building or campus.
- C.) It is a privately-owned network within a single building or up to a few kilometers in size.
- D.) It covers a city.

105. Which type of network does Frame Relay belong to?

- A) circuit switching
- B) message switching
- C) packet switching
- D) frequency switching

106. Full name of P2P is \_\_\_\_\_ .

- A.) Peer to Peer
- B.) Person to Person
- C.) People to People
- D.) Protocol to Protocol

107. In original ARPANET, the subnet would consist of minicomputers called \_\_\_\_\_ .

- A.) repeater
- B.) switch
- C.) routers
- D.) IMPs

===== physical layer =====

108. A signal consists of 8 discrete levels, it is sent over a low-pass noiseless channel of bandwidth 4 kHz, what is the maximum achievable data rate?

- A.) 12000 bps
- B.) 24000 bps
- C.) 32000 bps
- D.) It can be infinite

109. If a digital signal is modulated and sent over a channel whose signal-to-noise ratio is 63:1, and its passed signal frequencies are 2 to 18 KHz, what is the maximum achievable data rate?

- A.) 9600 bps
- B.) 96000 bps
- C.) 19200 bps

D.) 192000 bps

110. Which is not the component of transmission system using signal-mode optical fiber?

- A.) LED
- B.) photodiode
- C.) optical fiber cable
- D.) semiconductor laser

111. What is the cable between two telephone switches that have a distance of 4 KM?

- A.) Subscriber loop
- B.) local loop
- C.) trunk
- D.) codec

112. In packet switching, circuit switching and message switching, which one does not utilize store-and-forward transmission technology?

- A.) packet switching
- B.) circuit switching
- C.) message switching
- D.) none of above

113. In packet switching, circuit switching and message switching, which one has the smallest transmission delay for data unit?

- A.) packet switching
- B.) circuit switching
- C.) message switching
- D.) both message switching and packet switching

===== Data link layer =====

114. A bit string, 10111 11101 11110, needs to be transmitted at the data link layer. What is the string actually transmitted after bit stuffing?

- A.) 10111 110101 11110
- B.) 10111 11101 111100
- C.) 10111 111001 11110
- D.) None of the above

115. In \_\_\_\_\_-based flow control, the receiver sends back information to the sender giving it permission to send more data.

- A.) feedback
- B.) rate
- C.) PPP

D.) character

116. What is the remainder when dividing  $x^7 + x^5 + 1$  by the generator polynomial  $x^3 + 1$ ?

A.)  $X^4 + x^2 + 1$

B.)  $X^2 + x + 1$

C.)  $X^2 + x$

D.)  $X^2 + 2x$

117. Assume that Go-Back-N protocol and 3-bit sequence number are used, the sending window size is 5. After a station has sent the frame with sending sequence number 6, it receives an ACK frame with ACK sequence number 4, then the sending sequence number of the final frame that the station can send within sending window is \_\_\_\_.

A.) 1

B.) 2

C.) 7

D.) 0

118. For the above question, if the sending window size is 3, then the sending sequence number of the final frame is \_\_\_\_.

A.) 1

B.) 2

C.) 7

D.) 0

119. A data link protocol uses Go-Back-n, and 4 bits are used for sequence number, which is not allowed as sending window size?

A.) 15

B.) 16

C.) 1

D.) 8

===== MAC layer =====

120. When PCF (Point Coordination Function) is employed, users of 802.11 use a technology called \_\_\_\_\_.

A.) PCM

B.) FDM

C.) TDM

D.) WDM

121. Which uses the thin coaxial cable?

A.) 10Base5.

- B.) 10Base-F.
- C.) 10Base-T.
- D.) 10Base2.

122. Which of the following can be a substitution for ADSL in future?

- A.) 802.3
- B.) 802.11
- C.) 802.5
- D.) 802.16

123. Which is not the result of a broadcast storm?

- A.) The entire LAN capacity is occupied by these frames.
- B.) All the machines on all the interconnected LANs are busy with processing and discarding all the broadcast frames.
- C.) The bandwidth for normal traffic is little.
- D.) A loop will be formed.

124. Which is the broadcast address of Ethernet MAC frame?

- A.) FF-FF-FF-FF-FF-FF
- B.) FF-FF-FF-FF
- C.) 255.255.255.255
- D.) None of the above

125. Which description is false about the forwarding procedure of a bridge?

- A.) If destination and source LANs are the same, discard the frame.
- B.) If the destination and source LANs are different, forward the frame.
- C.) Every entry of the bridge's forwarding table will never be deleted.
- D.) If the destination LAN is unknown, use flooding.

126. Which device will extend the size of LAN's collision domain?

- A.) Bridge
- B.) repeater
- C.) switch
- D.) router

===== network layer =====

127. Which of the following statements about IPv4 header fields is incorrect?

- A.) IHL field tells how long the header is.
- B.) The Time to live field is a counter used to limit packet lifetimes.
- C.) The Protocol field tells network layer which upper-layer protocol process to give datagram to.
- D.) The Total length field indicates the payload length of the datagram.

128. Which is not the private address that will not appear in Internet datagram?
- A.) 10.8.8.8
  - B.) 192.168.8.8
  - C.) 12.8.8.8
  - D.) 172.16.8.8
129. The subnet mask is 255.255.255.248. How many hosts are available in this subnet?
- A.) 6
  - B.) 2
  - C.) 8
  - D.) 14
130. Which of the following statements about default route is correct?
- A.) In route table, a default route is an entry with the destination network 0.0.0.0 and subnet mask 0.0.0.0.
  - B.) In route table, a default route is an entry with the destination network 0.0.0.0 and subnet mask 255.255.255.255.
  - C.) If default route exists, it will be first selected and used.
  - D.) Default route provides the shortest path.
131. Which one is not a part of link-state routing algorithm?
- A.) A router discovers its neighbors and learn their network addresses.
  - B.) A router exchanges route table with its neighbors.
  - C.) A router measures the delay or cost to each of its neighbors.
  - D.) A router constructs a packet telling all it has just learned.
132. The problem of running out of IP addresses is not a theoretical problem that might occur at some point in the distant future. Some people felt that a quick fix was needed for the short term under current IPv4 environment. This quick fix came in the form of \_\_\_\_\_.
- A.) RARP
  - B.) NAT
  - C.) IPv6
  - D.) DHCP
133. Which is an illegal IPV6 address?
- A.) :210.23.187.24
  - B.) 3400::4443:89AB:EFBD
  - C.) 3400:0:0:C0E4:0:4443:89AB:EFBD
  - D.) ::3400:89AB:EFBD

===== transport layer =====

134. Two-army problem tells us that \_\_\_\_\_.  
A.) Three-way handshake is needed to establish a connection.  
B.) Designing a perfect protocol to close a connection is extremely difficult.  
C.) Three-way handshake is needed to close a connection.  
D.) Two-way handshake is needed to close a connection.
135. Timestamp is used in \_\_\_\_\_.  
A.) RPC  
B.) UDP  
C.) TCP  
D.) RTP
136. Which protocol does not match its well known port?  
A.) FTP vs 120  
B.) Telnet vs 23  
C.) HTTP vs 80  
D.) SMTP vs 25
137. Which protocol uses TCP?  
A.) RTP  
B.) DNS  
C.) POP-3  
D.) RPC
138. If the congestion window size is 30KB, and the receive window size is 50KB, what is the maximum bytes the TCP entity can transmit before ACK comes back?  
A.) 30KB  
B.) 50KB  
C.) 80KB  
D.) 20KB

===== application layer =====

139. Which one is not a legal resource record in DNS server?  
A.) www.zju.edu.cn 86400 IN SOA star boss (43271,7200,7200,2347,8792)  
B.) zju.edu.cn 86400 IN MX 1 ema.zju.edu.cn  
C.) www.zju.edu.cn 86400 IN HINFO Redhat Linux 9.0  
D.) www.zju.edu.cn 86400 IN A zju.edu.cn
140. Which one is not a common protocol (or scheme) used in URL?  
A.) FTP  
B.) HTTP  
C.) RPC  
D.) File

141. Which one represents a correct HTML tag for form?
- A.) `<form ACTION="http://www.intel.com/cgi-bin/scpu" type=radio method=get>`
  - B.) `<form ACTION="http://www.intel.com/cgi-bin/scpu" type=text method=put >`
  - C.) `<form ACTION="http://www.intel.com/cgi-bin/scpu" method=post >`
  - D.) `<form ACTION="http://www.intel.com/cgi-bin/scpu" method=push >`
142. Client-side dynamic web page generation may use following technologies: JavaScript, Java applet, Activex control. Which of the following statements is incorrect?
- A.) JavaScript programs have the best portability among them.
  - B.) JavaScript programs are easier to write.
  - C.) Java applets execute faster.
  - D.) ActiveX controls run faster of all.
143. When a user clicks on a hyperlink, `http://www.zju.edu.cn/lib/index.html`, the browser carries out a series of steps in order to fetch the page pointed to. Which one is not in these steps?
- A.) The browser determines the URL
  - B.) The browser asks DNS for the IP address of `www.zju.edu.cn`
  - C.) The browser sends a UDP request asking for file `/lib/index.html`
  - D.) The browser displays all the text in `index.html`
144. A cookie may contain five fields, Which one is not in these fields?
- A.) The domain field which indicates the server's domain name.
  - B.) The path field that identifies which parts of the server's file tree may use the cookie.
  - C.) The expire field that specifies when the cookie expires.
  - D.) The protocol field that specifies what protocol is used.
145. Common Gateway Interface(CGI) is a standardized interface to allow Web Server to talk to back-end programs and scripts, this Web Server sends pages to browser.
- A.) active
  - B.) form
  - C.) dynamic
  - D.) static

===== network security =====

146. The purpose of \_\_\_\_\_ is to prevent adversary from modifying or altering information.
- A.) secrecy
  - B.) authentication



C.) Integrity control

D.) nonrepudiation

147. In \_\_\_\_\_ each letter or group of letters is replaced by another letter or group of letters to disguise it.

A.) Transposition Cipher

B.) substitution cipher

C.) SHA-1

D.) MD5

148. \_\_\_\_\_ is based on Galois field theory, it uses substitution, permutations, and multiple rounds of calculations.

A.) DES

B.) AES

C.) MD5

D.) RSA

149. The Diffie-Hellman key exchange protocol allows two strangers to establish a shared secret key; however, it can be defeated by \_\_\_\_\_.

A.) bucket brigade attack

B.) reflection attack

C.) denial of service

D.) attack of electronic code book mode

150. Various schemes have been devised for digital signatures, using both symmetric-key and \_\_\_\_\_-key algorithms.

A.) one time

B.) private

C.) public

D.) session

三、 (21 points) In a TCP/IP network, an original IP datagram contains 1500 bytes of data (i.e. payload) and 36 bytes of header. When it passes through a router with the maximum datagram length (header + data) of 420 bytes, it breaks into multiple fragments. In the format (header length, total length, Identification, DF, MF, offset), the values of original datagram's header fields are (9, 1536, 13762, 0, 0, 0).

(1). The original datagram breaks into \_\_\_\_\_ fragments, the length of the first fragment's data part is \_\_\_\_\_ bytes, and the length of the last one's data part is \_\_\_\_\_ bytes.

(2). Please fill these fragment's header field values with the format (header length, total length, Identification, DF, MF, offset) in following blanks:

the first fragment: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

the second fragment: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

the last fragment: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

answer: (1). The original datagram breaks into 4 fragments, the length of the first fragment's data part is 384 bytes, and the length of the last one's data part is 348 bytes.

(2). Please fill these fragment's header field values in a format (header length, total length, Identification, DF, MF, offset) in following blanket:

1# fragment (9, 420, 13762, 0, 1, 0)

2# fragment (9, 420, 13762, 0, 1, 48)

4# fragment (9, 384, 13762, 0, 0, 144)

四、 (10 points) Consider building a CSMA/CD network running at 100 Mbps over a 800-m cable without repeater. The signal speed in the cable is 200,000 km/sec, and station A and B are located in the two end of the cable. Please fill values in following blanks.

(1). The time to transmit 1 byte is noted as T,  $T = \underline{(1)}$   $\mu\text{s}$ , a frame can run (2) meters along the cable in interval T.

(2). The round trip time between A and B is (3)  $\mu\text{s}$ , the minimum frame size should be (4) bytes.

(3). If the data rate becomes 1 Gbps and the cable length becomes 200 meters, the minimum frame size should be (5) bytes.

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answer (1). The time to transmit 1 byte is noted as T,  $T = \underline{0.08}$   $\mu\text{s}$ , a frame can run 16 meters along the cable in interval T.

(2). The round trip time between A and B is 8  $\mu\text{s}$ , the minimum frame size should be 100 bytes.

(3). If the data rate becomes 1 Gbps and the cable length becomes 200 meters, the minimum frame size should be 250 bytes.

五、 (9 points) HDLC and TCP are different protocols, some features are discussed as follows, please choose appropriate word from the optional words list and fill it in the blank.

(1). The sending sequence number of HDLC PDUs increments by 100 when 100 (1) are sent, while the sending sequence number of TCP PDUs increments by 100 when 100 (2) are sent.

(2). HDLC's sending window uses a (3) value; TCP's sending window uses a (4) value which is determined by the header field "(5)" of the TCP segment sent by receiver.

(3). TCP uses \_\_\_\_\_ (6) \_\_\_\_\_ handshake to establish a connection. Some segment's flag bit \_\_\_\_\_ (7) \_\_\_\_\_ is set to 1 during the period of connection establishment.

(4). In TCP, when receiver sends a PDU with its field \_\_\_\_\_ (8) \_\_\_\_\_ set to 0, the sender should stop sending data; In HDLC, when receiver sends a PDU with its field type set to 2 which stands for \_\_\_\_\_ (9) \_\_\_\_\_, the sender should stop sending data.

The optional words are listed as follows:

FIN, RECEIVE-NOT-READY, window-size, SYN, REJECT, bytes, datagrams, fixed, three-way, segments, RESET, two-way, variable, messages, frames, URG

Answer:

(1). The sending sequence number of HDLC PDUs increments by 100 when 100 frames are sent, while the sending sequence number of TCP PDUs increments by 100 when 100 bytes are sent.

(2). HDLC's sending window uses a fixed value; TCP's sending window uses a variable value which is determined by the header field "window-size" of the TCP segment sent by receiver.

(3). TCP uses three-way handshake to establish a connection. Some segment's flag bit SYN is set to 1 during the period of connection establishment.

(4). In TCP, when receiver sends a PDU with its field window-size set to 0, the sender should stop sending data; In HDLC, when receiver sends a PDU with its field type set to 2 which stands for RECEIVE-NOT-READY, the sender should stop sending data.

## Chapter2 课堂练习

1. 如果在一条 3kHz 的信道上发送一个二进制信号, 该信道的信噪比为 20dB, 则最大可达到的数据传输率为多少?

Answer:

A signal-to-noise ratio of 20 dB means  $S/N = 100$ . Since  $\log_2 101$  is about 6.658, the Shannon limit is about 19.975 kbps. The Nyquist limit is 6 kbps. The bottleneck is therefore the Nyquist limit, giving a maximum channel capacity of 6 kbps.

2. 有 10 个信号, 每个都要求 4000Hz, 现在用 FDM 将他们复用在一信道上。对于被复用的信道, 最小要求多少带宽? 假设防护频段为 400Hz 宽。

Answer:

There are ten 4000 Hz signals. We need nine guard bands to avoid any interference. The minimum bandwidth required is  $4000 \times 10 + 400 \times 9 = 43,600$  Hz.

3. When we use a modem, which use 16 phases signal to modulation, then how much can we get the maximum data rate in a 2400 baud channel (in noiseless channel)?

- A. 400bps      B. 2400bps      C. 9.6kbps      D. 14.4kbps