浙江大学 2018－2019 学年秋冬学期
《计算机网络》期末考试试卷

课程号：21121340　　开课学院：计算机学院和软件学院

考试试卷：A 卷 √、B 卷　　考试形式：闭 √、开卷，允许带 / 入场

考试日期：2018 年 1 月 20 日　　考试时间：120 分钟

诚信考试，沉着应考，杜绝违纪。

考生姓名：_____学号：_____所属院系：_____

题序	一	二	三	四	五	六	七	八	总 分
得分									
评卷人									

Write answers of Part 1-2 here

Part 1. (10 points) write √ for true, × for false.

1	2	3	4	5	6	7	8	9	10

Part 2. (30 points) write A, B, C or D.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30

Part 1. (10 points) Please choose true (√) or false (×) for the statements.

1. The cable between toll office and the end office of Telephone Company are known as the local loop.
2. As a data packet moves from the lower layer to the upper layer, its header is subtracted.
3. One type of person-to-person communication often goes by the name of end-to-end communication, to distinguish it from the client-server model.
4. The problem of a station not being able to detect a potential competitor for the medium because the competitor is too far away is called the exposed station problem. The reverse situation is called the hidden station problem.
5. The core concept of MPLS is to add a label in front of each packet and doing the routing based on the label rather than on the destination address.
6. In virtual-circuit network, after virtual-circuit is established, each data packet contains an ID, not the full destination address.
7. The resource record type MX in DNS is related to the mail server.
8. The private key of B will be used if A wants to send encrypted data to B when using public-key algorithms.
9. In the TDM system, the users take turns, each one periodically getting the entire bandwidth for a little burst of time.
10. The data is not submitted in header of HTTP request when using POST method.

Part 2. (30 points) Please choose the best answer for each question.

1. Which of the following description about OSI layers is incorrect?
   A. The application layer contains a variety of protocols that are commonly needed by users
   B. The network layer controls the operation of the subnet and determines how packets are routed from source to destination
   C. The data link layer is a true end-to-end layer, all the way from the source to the destination
   D. The physical layer is concerned with transmitting raw bits over a communication channel
2. Some broadcast systems also support transmission to a subset of the machines, which known as _____.
   A. unicasting B. broadcasting C. multicasting D. anycasting
3. The _____ defines which primitive operations and services the lower layer makes available to the upper one.
   A. service B. protocol C. process D. interface
4. To use a _____ network service, the service user first establishes a connection, uses the connection, and then releases the connection.
   A. connectionless B. connection-oriented C. connected D. acknowledged
5. The _____ layer is concerned with transmitting raw bits over a communication channel.
   A. media B. data link C. communication D. physical
6. Ten signals, each requiring 4 kHz, are multiplexed onto a single channel using FDM. What is the minimum bandwidth required for the multiplexed channel? Assume that the guard bands are 400 Hz wide.
   A. 40000Hz B. 43600Hz C. 44000Hz D. None of above
7. A noisy channel has a bandwidth of 3 KHZ, its signal to noise ratio is 2047, and then its maximum data rate will be _____.
   A. 33 kbps B. 66 kbps C. 132 kbps D. 4 kbps
8. What is the baud needed when use 4B/5B scheme for 100 Mbps baseband transmission?

A. 100M B. 200M C. 125M D. 50M

9. To reliably detect 3 single-bit errors, how many Hamming distance do we need?
A. 3 B. 4 C. 5 D. 6

10. What is the receiver's window size of the selective repeat protocol when the sending window size is 4?
A. 1 B. 4 C. 8 D. 16

11. According to CSMA/CD, if the propagation time of the line is 100ms, the transmission time of the frame must not less than:
A. 200ms B. 300ms C. 400ms D. 500ms

12. A bit string, 0111101111101111110, need to be transmitted at the data link layer, What is the string actually transmitted after bit stuffing?
A. 0111101111101111110 B. 01111011111011111010
C. 01111011111011111010 D. None of above

13. The Ethernet uses an algorithm called binary exponential back-off, after 2 collisions, the station will chose a random number between 0 and _____.
A. 0 B. 1 C. 2 D. 3

14. All stations in the same VLAN are in the same _____ domain.
A. collision B. broadcast C. contention D. all of above

15. According to CSMA/CA protocol used by 802.11, before the station sending a data, it must send _____ frame and wait a _____ frame back.
A. CTS, RTS B. DTR, CTS C. RTS, TCS D. RTS, CTS

16. A CDMA receiver gets the following chips: (+1 +1 -1 +3 +1 +1 -3 +1). Assuming the chip sequences defined in following:
Station A: (-1 +1 -1 +1 +1 +1 -1 -1) Station B: (-1 -1 -1 +1 +1 -1 +1 +1)
Station C: (-1 +1 -1 -1 -1 -1 +1 -1) Station D: (-1 -1 +1 -1 +1 +1 +1 -1)
Which stations transmitted, and which bits did each one send?
A. Station A transmitted bit 0 B. Station B transmitted bit 1
C. Station C didn't transmit D. Station D transmitted bit 0

17. Consider the effect of using slow start on a line with a 10-msec round-trip time and no congestion. The receive window is 24 KB and the maximum segment size is 2 KB. How long does it take before the first full window can be sent?
A. 20ms B. 24ms C. 40ms D. 50ms

18. For a subnet 192.168.2.4/30, how many hosts can receive the packet with a destination address as 192.168.2.7?
A. 1 B. 2
C. 3 D. 4

19. What is used at the transport layer to stop a receiving host's buffer from overflowing?
A. Segmentation B. Packets
C. Acknowledgments D. Flow control

20. Which type of service is provided by TCP?
A. request-reply B. acknowledged datagram
C. reliable message stream D. reliable byte stream

21. Which is the function of ports in the UDP datagram?
A. The source port is used to identify the application protocol type of the sender
B. The destination port is used to identify the network protocol type of the receiver
C. The destination port is used to identify the application where to deliver payload
D. The source port is used to identify the network address of the sender

22. Which socket primitive is used to block the caller until a connection attempt arrives?
A. bind B. listen C. connect D. accept

23. In the Wireshark software, which is the capture filter used to capture only SMTP packets?
A. tcp smtp B. tcp port 25 C. host smtp D. tcp port 80

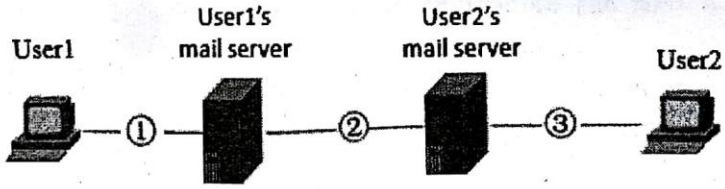
24. If the state of a TCP connection is in SYN_RCVD, what is the TCP entity waiting for?
A. a segment with SYN flag arrived
B. a segment with ACK flag arrived
C. a segment with FIN flag arrived
D. maximum time for a segment die off

25. Suppose that the TCP congestion window is set to 20 KB and a timeout occurs. How big will the window be after next four transmission bursts are all successful? Assume that the maximum segment size is 1 KB and Tahoe is used.
A. 4KB B. 10KB C. 16KB D. None of above

26. In a network that has a maximum TPDU data size of 640 bytes, a maximum TPDU lifetime of 40 sec, and a 6-bit sequence number, what is the maximum data rate per connection?
A. 8192 bps B. 8064 bps C. 1024 bps D. None of above

27. A binary file is 3072 bytes long. How long will it be if encoded using base64 encoding, with a CR+LF pair inserted after every 80 bytes sent and at the end?
A. 3150 B. 4096 C. 4200 D. None of above

28. If the process of sending and receiving e-mail between user 1 and user 2 is shown in the following figure, the application layer protocol used in ①, ②, and ③ in the figure can be _____.



A. SMTP、IMAP、SMTP B. POP3、SMTP、IMAP
C. POP3、IMAP、SMTP D. SMTP、SMTP、IMAP

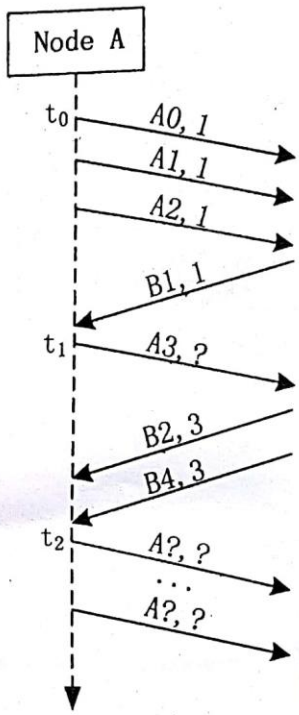
29. Which key is the browser used to verify the certificate of the website?
A. The public key of the website
B. The private key of the CA
C. The public key of the CA
D. The private key of the website

30. Which sentence is not correct?
A. Diffie-Hellman key exchange algorithm allows strangers to establish a shared secret key but has problem of man-in-the-middle attack.
B. One of cryptographic principles is redundancy, another is freshness.
C. Quantum cryptography is one of method to transmit one-time pad over network but the equipment is complex and expensive now.
D. The replay attack is a way to authenticate by tricking the target into providing the answer to its own challenge.

Part 3. Node-A and Node-B use the Go-Back-N protocol for continuous two-way data transmission, both parties use piggyback acknowledgement and same frame format as following: *(20 points)*

16 bits	4 bits	4 bits	968 bits	8 bits
Control	Sequence Number	Ack Number	Data	Checksum

Figure (a) is the scene in which the Node-A sends and receives data frames. Ax, y and Bx, y respectively denote the data frames sent by Node-A and Node-B, where x is the sequence number for the outgoing frame, y is the acknowledgment number for the next incoming frame to receive.



(a)

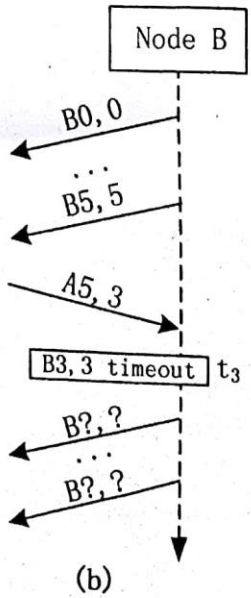
1. If using CRC to calculate the checksum, the length of the generator polynomial should be 9 bits.
2. If using hexadecimal signal to send over a 6-kHz noiseless channel, the maximum achievable data rate will be 48 kbps.
3. At t_1 the acknowledgement number of frame A3 sent by Node-A should be 2.
4. From t_0 to t_2, Node-A can confirm that total 3 frames Node-B has received correctly. Denote them as Ax, y:

	Sequence Number (X)	ACK Number (Y)
First frame: A	0	1
Last frame: A	2	1

5. From t_2, assume Node-A has enough data to be transmitted, if no timeout occurred and no more data frame is received from Node-B, Node-A can send 14 data frames maximally. Denote them as Ax, y:

	Sequence Number (X)	ACK Number (Y)
First frame: A	4	3
Last frame: A	1	3

6. Figure (b) is the scene in which the Node-B sends and receives data frames. From t_3, if no new timeout occurred and no more data frame is received from Node-A, Node-B needs to retransmit 3 data frames. Denote the new retransmission frames as Bx, y:



(b)

	Sequence Number (X)	New ACK Number (Y)
First frame: B	3	5 (3?)
Last frame: B	5	5

7. Assume the data transmission rate of the channel is 10 Mbps and the propagation time of the channel is 1.15 ms, consider the transmission time of acknowledgment frame, what is the maximum channel utilization that Node-A can achieve?

Calculation formula		Result
	=	%

Part 4. Host A with address 10.0.0.8 communicated to server B via Internet. Packets were captured at host A, following are five of them:

No.	offset	The first 40 bytes of IP packet header (HEX)				
1	0000	45 00 00 30	01 9B 40 00	80 06 1D E8	0A 00 00 08	A0 08 00 50
	0014	01 02 10 0A	00 00 00 15	00 00 00 00	70 02 20 18	5D B0 00 00
2	0000	45 00 00 30	00 00 40 00	31 06 6E 83	A0 08 00 50	0A 00 00 08
	0014	10 0A 01 02	00 00 00 0F	00 00 00 16	70 12 10 04	37 E1 00 00
3	0000	45 00 00 28	01 9C 40 00	80 06 1D EF	0A 00 00 08	A0 08 00 50
	0014	01 02 10 0A	00 00 00 16	00 00 00 10	50 10 20 18	2B 32 00 00
4	0000	45 00 00 38	01 9D 40 00	80 06 1D DE	0A 00 00 08	A0 08 00 50
	0014	01 02 10 0A	00 00 00 16	00 00 00 10	50 18 20 08	C6 55 00 00
5	0000	45 00 00 38	68 11 40 00	31 06 06 7A	A0 08 00 50	0A 00 00 08
	0014	10 0A 01 02	00 00 00 10	00 00 00 26	50 10 10 04	57 D2 00 00

At the same time, packets were captured at server B, following are two of them:

No.	offset	The first 40 bytes of IP packet header (HEX)				
6	0000	45 00 00 38	68 11 40 00	40 06 EC AD	A0 08 00 50	C0 0A 01 06
	0014	10 0A 10 04	00 00 00 10	00 00 00 26	50 10 10 04	B7 D6 00 00
7	0000	45 00 06 00	68 12 40 00	40 06 2D 10	A0 08 00 50	C0 0A 01 06
	0014	10 0A 10 04	00 00 00 20	00 00 00 36	50 10 10 04	C5 23 00 00

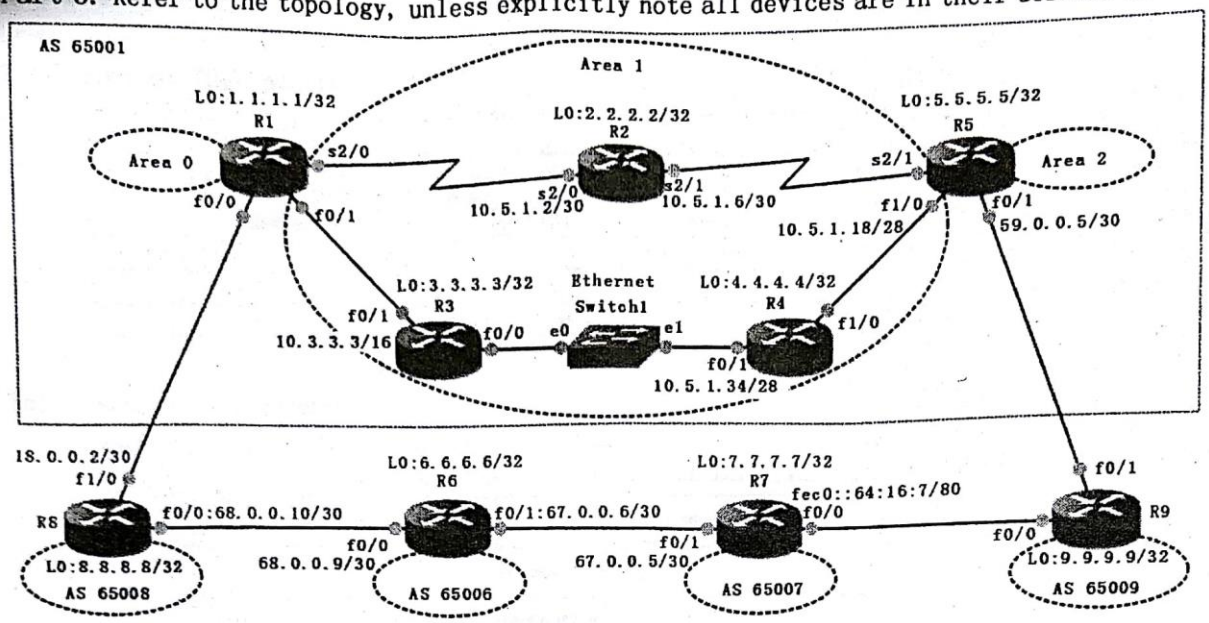
Fill the blank in following questions. All answers should be decimal. *(20 points)*

You can find some useful information from Part 6 at the last page.

1. The TTL of packet No. 2 is 49.
2. How many routers passed before the packet No. 6 arrived to the host A: 15.
3. From 1 to 4, packet No. 2 is NOT sent by the host A.
4. From 1 to 4, packet No. 4 is NOT used for TCP connection establishment.
5. From 1 to 4, packet No. 3 need fill out the frame to the minimum size at the Ethernet MAC layer.
6. The total length of application data in TCP segment of packet No. 5 is 16 bytes.
7. The TCP acknowledgement number of packet No. 7 is 54, it means total ? bytes of application data have received correctly by server B after three-way handshake.
8. The public IP address of host B is 160.30.0.80.
9. The host A should behind NAT device, which public IP address is 192.10.1.6.
10. The port number listened by host A is 258.
11. The port number listened by server B is 4016 (0x100A).
12. The window size of packet No. 4 is 32000 byes.
13. Assume the congestion window size is 6K bytes, after receiving packet No. 5, host A can send 4100 bytes of application data maximally.
14. Packet No. 7 will be fragmented into 2 fragments when passing through a small network which MTU is 800 bytes (not including data link layer overhead). Show the total length, MF, fragment offset field of each fragment packet.

	Total length	MF	Fragment offset
The first one:	796	1	0
The second one:	780	0	97

Part 5. Refer to the topology, unless explicitly note all devices are in their default state.



Fill the blank in the following questions. (20 points)

You can find some useful information from Part 6 at the last page.

1. Complete the commands to assign port e0 to vlan 2 in switch 1:

   Switch1(config)# interface e0

   Switch1(config-if)# switch-port mode access

   Switch1(config-if)# _____

2. Using one of following IP addresses to complete the address configuration commands:

   10.5.0.1 10.5.0.5 10.5.0.15 10.5.0.16 10.5.0.17 10.5.0.32 10.5.0.33

   10.5.1.1 10.5.1.5 10.5.1.15 10.5.1.16 10.5.1.17 10.5.1.32 10.5.1.33

   R3(config)# interface f0/0

   R3(config-if)# _____

   R5(config)# interface s2/1

   R5(config-if)# _____

3. Complete the commands to configure OSPF in R1:

   R1(config)# interface loopback 0

   R1(config-if)# _____ (assign IP address)

   R1(config)# router ospf 1

   R1(config-router)# _____ (advertise network of f0/1)

   After configuration, the Router ID of R1 will be _____.

4. Complete the commands to establish a virtual link between R1 and R5 for Area 2:

   R5(config)# router ospf 1

   R5(config-router)# _____

5. Assume OSPF in all routers in AS 65001 are configured correctly, from R1, the next hop to the network in area 2 will be _____.

   A) 10.3.1.1 B) 10.3.3.3 C) 18.0.0.2 D) 10.5.1.2

6. Complete the commands to configure BGP in router R5:

R5(config)# router bgp 65001

R5(config-router)# _____ (advertise network of f0/1)

R5(config-router)# _____ (set R5 as neighbor)

R5(config-router)# _____ (set R8 as neighbor)

7. Complete the commands in R1 to let inner routers learning networks out of autonomous system:

R1(config)# _____

R1(config-router)# _____

8. Complete the commands in R5 to let routers out of autonomous system learning inner networks:

R5(config)# _____

R5(config-router)# _____

9. Which site-local address can be assigned to port f0/0 in R9? _____

A) fe80::64:16:9 B) fec0:64:16:9 C) fec0::9:16:64 D) fec0:64:16::9

10. Assume BGP in all routers are configured correctly using default configuration, from R6, the next hop to the network in area 2 will be _____.

A) 67.0.0.5 B) 67.0.0.6 C) 68.0.0.9 D) 68.0.0.10

Following is some output of 'show ip route' in R1:

B 10.5.1.40/30 [200/0] via 10.5.1.18, 00:00:20

R 10.5.1.64/26 [110/20] via 10.3.2.2, 01:22:25, FastEthernet1/0

O 10.5.1.16/28 [120/1] via 10.3.3.3, 01:22:25, FastEthernet0/1

S 10.5.1.128/26 [1/0] via 18.0.0.2

S 10.5.1.48/28 [1/0] via 10.5.1.2

C 10.3.0.0 is directly connected, FastEthernet0/1

C 1.1.1.1/32 is directly connected, Loopback0

S 0.0.0.0/0 via 10.1.0.2

According the routing table above, answer following questions:

11. Which route has highest priority in the routing table? _____

A) the route tagged with 'O'

B) the route tagged with 'B'

C) the route tagged with 'S'

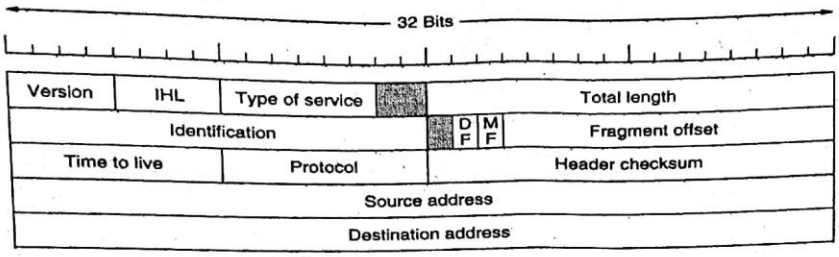
D) the route tagged with 'R'

12. The next hop should be the IP address _____ if a packet with destination address 10.5.1.36 and source address 10.5.1.129 arrive.

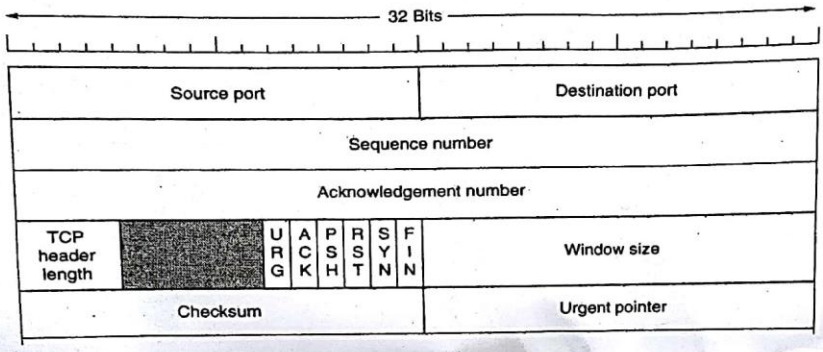
13. The next hop should be the IP address _____ if a packet with destination address 10.5.1.60 and source address 18.0.0.2 arrive.

Part 6. Useful Reference

The header of IPv4 packet:



The header of TCP segment:



Cisco IOS commands:

interface <> <> / switch-port mode <> / switch-port access vlan <>
no <> / encapsulation dotlq <> / shutdown / vlan database / vlan <>
ip address <> <> / ip route <> <> <> / router ospf <> / router bgp <>
network <> <> area <> / network <> mask <> / area <> virtual-link <>
neighbor <> remote-as <> / neighbor <> update-source <> <>
redistribute <> <> subnets / redistribute <> <> / configure terminal