四川大学期末考试试题（闭卷）

（2019~2020 学年第 1 学期）　　B 卷

课程号：**311105040**　课程名称：**计算机网络**　任课教师：＿＿＿＿

适用专业年级：**软件工程 2017 级**　学号：＿＿＿＿　姓名：李秉瑾

考生承诺

我已认真阅读并知晓《四川大学考场规则》和《四川大学本科学生考试违纪作弊处分规定（修订）》，郑重承诺：

1、 已按要求将考试禁止携带的文具用品或与考试有关的物品放置在指定地点；

2、 不带手机进入考场；

3、 考试期间遵守以上两项规定，若有违规行为，同意按照有关条款接受处理。

考生签名：

题　　号	1 (30%)	2 (20%)	3 (30%)	4 (20%)
得　　分				
卷面总分		阅卷时间		

注意事项： 1. 请务必将本人所在学院、姓名、学号、任课教师姓名等信息准确填写在试题纸和添卷纸上；
2. 请将答案全部填写在本试题纸上；
3. 考试结束，请将试题纸、添卷纸和草稿纸一并交给监考老师。

评阅教师	得分

1. Multiple Choice (30 points, 1.5 points for each question)

1	2	3	4	5	6	7	8	9	10
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**

A (1) The units of data exchanged by a link-layer protocol are called _____.

A Frames　B Segments　C Datagrams　D bit streams

B (2) In the OSI reference model, what is the first layer from the bottom up to provide end-to-end services?

A Data Lin k　B Transport　C Session　D Application

B (3) Provided RcvBuffer=20, LastByteRcvd=20,LastByteRead=15, then RcvWindow= ____

A 14　B 15　C 16　D 10　20-5

A (4) The MSS is typically set by first determining the length of the largest link-layer frame that can be sent by the local sending host----the so-called _____ .

A　Maximum transmission unit (MTU)　　B　MSS
C　Checksum　　D　Sequence number

A (5) There are two 16-bit integers: 1110 0110 0110 0110, 1101 0101 0101 0101. Their checksum is _____.

A　0100010001000011　　B　1011101110111100
C　1111111111111111　　D　1000000000000000

C (6) Which of the following IP address doesn't belong to the 202.128.0.0/9 network?

A　202.128.128.1　　B　202.128.127.11
C　202.127.14.120　　D　202.129.1.1.29

B (7) In OSPF network, a _____ belongs to both an area and the backbone.

A　internal router　　B　area border router
C　boundary router　　D　backbone router

C (8) Suppose host A sends host B one TCP segment with sequence number 202, acknowledgement number 471, and 4 bytes of data. Then the sequence number in the acknowledgement to this segment is?

A　202　　B　206　　C　471　　D　475

A (9) In the following descriptions about HTTP, which one is not correct?

A　HTTP uses non-persistent connections in its default mode.
B　HTTP uses TCP as its underlying transport protocol.
C　HTTP is a stateless protocol.
D　HTTP is client-server architecture.

D (10) UDP and TCP both have the fields except _____

A　source port number　　B　destination port number
C　checksum　　D　sequence number UDP无

D (11) If we define N to be the window size, base to be the sequence number of the oldest unacknowledged packet, and nextseqnum to be the smallest unused sequence number, then the interval [base, nextseqnum-1] corresponds to packet that _____

A　can be sent immediately
B　have already been transmitted and acknowledged
C　cannot be used
D　have been sent but not yet acknowledged

A (12) In the following descriptions about FTP, which one is correct?

A control connection and data connection.
B receiving connection and sending connection.
C client connection and server connection.
D program connection and process connection.

RIP → based on UDP
BGP → based on TCP
OSPF → based on IP

C (13) Which of the following groups run on the top of UDP? _____
A FTP, ARP, SMTP.　　B IMAP, ARP, DNS
C DNS, RTP, RIP　　D DNS, POP3, ICMP

应用层　　网络层协议

A (14) _____ means that IPv6 nodes also have a complete IPv4 implementation as well?
A Dual stack　　B Tunneling　　C Bridge connection　　D Forwarding

C (15) In the loop of the Dijkstra's algorithm, for node x, add y to N', and update the cost of y's neighbor v, then D(v) is _____.
A c(x, v)　　B min{D(v), D(x)+c(x, v)}
C min{D(v), D(y)+c(y, v)}　　D c(y, v)

A (16) In the following four descriptions about random access protocol, which one is not correct?
A In slotted ALOHA, nodes can transmit at random time.
B CSMA/CD cannot be implemented on a wireless channel.
C The maximum efficiency of a slotted ALOHA is higher than a pure ALOHA.
D In CSMA/CD, one node listens to the channel before transmitting.

B (17) Which of the following devices is not a plug and play device?
A hub　　B router　　C switch　　D repeater

A (18) Which of the following is wrong?
A ARP table is configured by a system administrator
B ARP table is built automatically
C ARP table is dynamic
D ARP table maps IP addresses to MAC addresses

D (19) Which of the flags in TCP header is used during the shutdown of a TCP connection?
A URG　　B ACK　　C SYN　　D FIN

B (20) Which MAC protocol is used by Ethernet?
A CSMA/CA　　B CSMA/CD　　C Token Passing　　D Polling

评阅教师	得分

2. True or False (20 points, 2 point for each statement)

1	2	3	4	5	6	7	8	9	10

(1) The efficiency of slotted ALOHA is twice that of unslotted ALOHA.

(2) An Ethernet switch maintains a mapping of IP addresses to MAC addresses.

(3) In IP, CRC is introduced for error detection.

(4) In UDP segment, a checksum field in UDP header is used to perform error detection for the whole datagram.

(5) RIP protocol may cause oscillation.

(6) When an Ethernet sender detects that the media is idle, it sends a jam signal onto the media to tell other devices not to transmit, and then it sends its packet.

(7) Consider Congestion Control in TCP. When a timer expires at the sender, the threshold is set to one half of its previous value.

(8) In CSMA/CD, the nodes begins to detect if the collisions occur after sending a frame.

(9) IP protocol provides connectionless and reliable delivery service.

(10) When the router receives a packet with a destination IP address of 202.10.162.255, the router will broadcast the packet to all hosts on the 202.10.0.0 subnet.

评语教师	得分

3. Please answer following questions briefly. (30 points)

(1) The relationship between TCP congestion window size (cwnd) and transmission rounds is as follows. Answers the following questions. (13points)

Round	1	2	3	4	5	6	7	8	9	10	11	12	13
Cwnd	1	2	4	8	16	32	33	34	35	36	37	38	39
Round	14	15	16	17	18	19	20	21	22	23	24	25	26
Cwnd	40	41	42	24	25	26	27	28	29	1	2	4	8

a) Identify the intervals of time when TCP slow start is operating. (2 points)

b) Identify the intervals of time when TCP congestion avoidance is operating. (2 points)

c) After the 16th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout? (1 points) triple duplicate ACK

d) After the 22th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout? (1 points) timeout

e) What is the initial value of ssthresh at the first transmission round? (1 points) ~~33~~ 32

f) What is the value of ssthresh at the 18th transmission round? (1 points) 21

g) What is the value of ssthreshat the 24th transmission round? (1 points) 14

h) During what transmission round is the 70th segment sent? (2 points) 7

i) Assuming a packet loss is detected after the 26th round by the receipt of a triple duplicate ACK, what will be the values of the congestion window size and of ssthresh? (2 points) Cwind = 8/2+3 = 7
ssh = 8/2 = 4

(2) Consider the network with 4 routers in figure 1, with link cost labeled. (5 points)

a) Show the operation of Dijkstra's (Link State) algorithm for computing the least cost path from node 2 to all destinations by fill the table below (3 points)

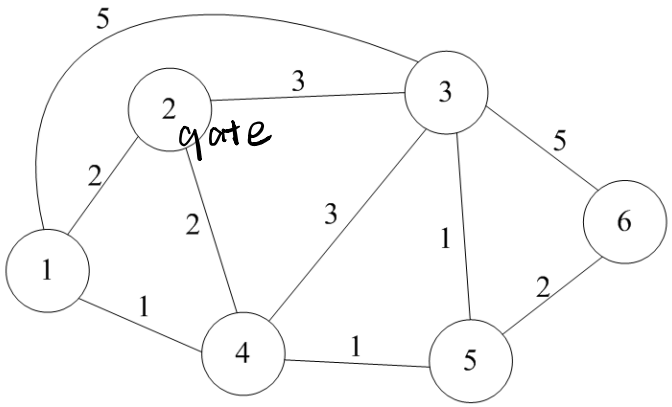

Figure 1.

step	N'	D (1), p (1)	D (3), p (3)	D (4), p (4)	D (5), p (5)	D (6), p (6)
0	2	2, 2	3, 2	2, 2	∞	∞
1	2, 1		3, 2	2, 2	∞	∞
2	2, 1, 4		3, 2		3, 4	∞
3	2, 1, 4, 3				3, 4	8, 3
4	2, 1, 4, 3, 5					5, 5
5	2, 1, 4, 3, 5, 6					

b) Let's assume that the network in Figure. 1 is an autonomous system in the Internet with AS number 0. Node 2 is the BGP gateway of this AS. Is Node 2 the only router in this network that runs BGP and DV algorithm simultaneously? Justify your answer. (2 points) 不是. Node 2：eBGP与DV

其他：iBGP+DV

(3) Assume there is a network as the figure 2. There are 3 subnets, 2 routers, 1 host and 1 server. (12 points)

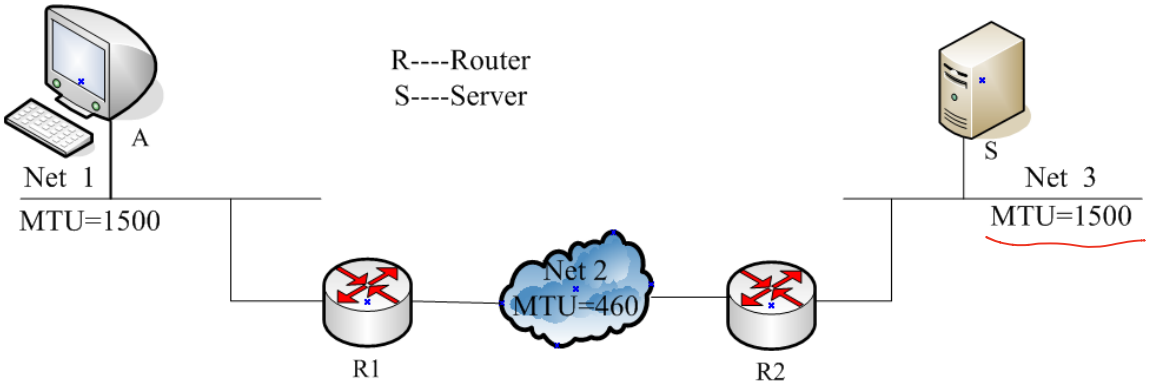

Figure 2.

a) Consider the browser on Host A want to retrieve a Web document on Server S. The IP address of Server S is initially unknown. What transport and application-layer protocols are needed in this scenario? (2 points)

传输层：UDP协议

应用层：DNS协议

b) Assume HTTP/1.1 uses persistent connections without pipelining, and there are 3 jpeg images referenced in rfc.html. Suppose that each downloaded object is 3Kbits long, how many RTTs will it take to obtain all the objects from sending the request messages? (2 points)

375 byte < 460

2RTT + 3×1RTT = 5RTT

每个下载文件3Kbits = 375 byte

考虑TCP与IP头 375+20+20 < 460

∴不会分片

c) Consider Server S sends an IP datagram with 1400 bytes of payload to Host A.

① What actions will Router R2 perform once it receives the datagram? Why? (2 points)

将IP数据报分片，因为链路MTU=460 < IP数据报长

② Please calculate the value of the corresponding header field in each fragment when the datagram passes through Net 2. (4 points)

Fragment	Datagram Length	Offset	Flag
1	460	0	1
2	460	55	1
3	460	110	1
4	80	165	0

$1400-3\times440=80$　$\frac{440}{8}=55$

③ Where will these fragments be reassembled? (2 points)

接收方A主机会将分片重组

评阅教师	得分

4. Analysis & Calculation. Please illuminate your analysis or calculation process step by step. (20 points)

Consider the network in figure 3. There are 2 routers, 1 switch, and 4 hosts. The switch table on Switch S is shown in Table 1.

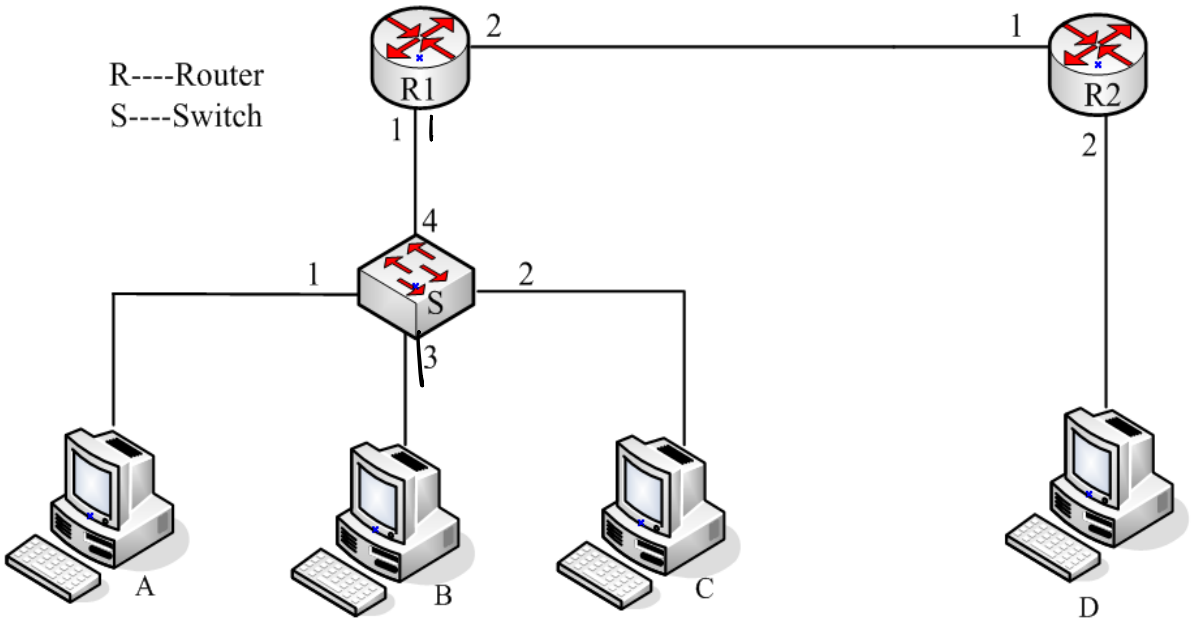

Figure 3.

Table 1. The Switch Table on Switch S

Address	Interface
B'S MAC	3
R1 INTERFACE#1'S MAC	4

a) Identify the number of subnets in the figure above. (1 point)

共3个子网

0100 0000

b) Let's assume that the block address is 202.115.32. 64/28, please assign IP address ranges to all subnets. (2 points)

4+2=6个　202.115.32.64/29
2个　202.115.32.64/30
2个　202.115.32.72/30
} 8个，用完 0000

无标准答案
(这么分有点奇葩)

c) Consider sending an IP datagram from Host A to Host C. Suppose all of the ARP tables are up to date. ①Which interface will Switch S forward this frame to? ②If C sends an ACK back to A after receiving the IP datagram, which interface will Switch S forward this frame to? (2 points)

①广播，接口2、3、4都会转发
②接口1

d) Suppose Host A would like to send an IP datagram to Host B, and neither A's ARP cache contains B's MAC address nor does B's ARP cache contain A's MAC address. Thus, A will broadcast an ARP request message. ①What actions will switch S perform once it receives the ARP request message? ②Will router R1 also receive this ARP request message? ③If so, will R1 forward the message to R2? Why? ④Once Host B receives this ARP request message, it will send back to Host A an ARP response message. But will it send an ARP query message to ask for A's MAC address? Why? ⑤What will switch S do once it receives an ARP response message from Host B? (10 points)

①复制，发送给每个接口　②会收到
③不会，因为目标IP地址为B的IP地址，与R2不在同一子网
④不会，因为B收到来自A的 ARP request中，已经包含A的IP与MAC地址
⑤将B's MAC地址对应接口信息填入自己的交换表中

e) Suppose Host A sends a datagram to Host D. Suppose all of the ARP tables are up to date. Provide MAC addresses and IP addresses for the interfaces at Host A, both routers, and Host D. Give the source and destination MAC addresses in the frame encapsulating this IP datagram as the frame is transmitted ①from Host A to Router R1, ②from Router R1 to Router R2, ③from Router R2 to Host D. Also give the source and destination IP addresses in the IP datagram encapsulated within the frame at each of these points in time. (5 points)

Packet from Host A to Router R1

Source MAC	*Destination MAC*	*Source IP*	*Destination IP*
A's MAC	R_1's MAC	**A 's IP**	D's IP

Packet form Router R1 to Router R2

Source MAC	*Destination MAC*	*Source IP*	*Destination IP*
R_1's MAC	R_2's MAC	R_1 interface 2's IP A's IP	D's IP

Packet from Router R2 to Host D

Source MAC	*Destination MAC*	*Source IP*	*Destination IP*
R_2's MAC	D's MAC	R_1 interface 2's IP A's IP	**D 's IP**

跟据d)中可知，所有主机IP分配已格式同

不考虑私有地址与内网穿透.