四川大学期末考试试题（闭卷）

（2020~2021 学年第 2 学期）　　　　　　　　A 卷

课程号：__311234040__　课程名称：__计算机网络和分布式系统__　　任课教师：_____

适用专业年级：__软件工程 2019 级__　　　　学号：_____　姓名：_____

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

(1). Transport-layer packets are called _____.

    (A) message　　　　　(B) segment　　　　　(C) datagram　　　　　(D) frame

(2). In _____ networks, the resources needed along a path to provide for communication between the end system are reserved for the duration of the communication session.

    (A) packet-switched　　(B) data-switched　　(C) circuit-switched　　(D) message-switched

(3). In a circuit-switched network, if each link has n circuits, for each link used by the end-to-end connection, the connection gets _____ of the link's bandwidth for the duration of the connection.

    (A) a fraction $1/n$　　(B) all　　　　　(C) $1/2$　　　　　(D) n times

(4). We are sending a 30 Mbit MP3 file from a source host to a destination host. Suppose there is only one link between source and destination and the link has a transmission rate of 10 Mbps. Assume that the propagation speed is $2*10^8$ meters/sec, and the distance between source and destination is 10,000km. Also suppose that message switching is used, with the message consisting of the entire MP3 file. How many bits will the source have transmitted when the first bit arrives at the destination? _____

(A) 1 bit　　　　　(B) 30,000,000 bits　　　　(C) 500,000 bits　　　(D) 100,000 bits

(5). Which of the following protocol layers is not explicitly part of the Internet Protocol Stack? _____

(A) application layer　(B) presentation layer　　(C) data link layer　　(D) transport layer

(6). In the following applications, which one is a loss-tolerant application? _____

(A) E-mail　　　　(B) file transfer　　　　(C) instant messaging　(D) real-time audio

(7). Suppose a web page consists of a base HTML file and 6 embedded JPEG images, and also suppose HTTP uses persistent connection without pipelining, the total response time is _____.

(A) 3 RTT　　　　(B) 4 RTT　　　　　(C) 8 RTT　　　　(D) 14 RTT

(8). If the header line Connection is close, it means that the client uses _____.

(A) persistent connection with pipelining　　　(B) persistent connection without pipelining

(C) nonpersistent connection　　　　　　　(D) connectionless transmission

(9). Suppose A (with a Web-based e-mail account) sends a message to B (who accesses his mail server using IMAP), which of the following application-layer protocols is not used? _____

(A) HTTP　　　　(B) SMTP　　　　　(C) POP3　　　　(D) IMAP

(10). In the following protocols, which one is stateless? _____

(A) HTTP　　　　(B) POP3　　　　　(C) FTP　　　　(D) IMAP

(11). In the following applications, which one uses UDP? _____

(A) E-mail　　　　(B) web application　　(C) file transfer　　(D) DNS

(12). The UDP header has only four fields, which are_____.

(A) Source port number, destination port number, length and checksum

(B) Source port number, destination port number, source IP and destination IP

(C) source IP, destination IP, source MAC address and destination MAC address

(D) source IP, destination IP, sequence number and ACK sequence number

(13). Suppose host A sends host B one TCP segment with sequence number 600, acknowledgement number 360, and 4 bytes of data. Then the sequence number in the acknowledgement to this segment is _____.

(A) 360　　　　　(B) 364　　　　　(C) 600　　　　(D) 604

(14). Which of the following is not a pipelining protocol? _____

　　(A) Rdt3.0　　　　　　(B) Go-Back-N　　　　(C) Selective repeat　　(D) TCP

(15). TCP provides flow control by having the sender maintain a variable called the _____.

　　(A) Receive window　　(B) Congestion window　　(C) Sliding window　　(D) Buffer

(16). The broadcast address of network 202.115.32.0/22 is_____.

　　(A) 202.115.32.255　　(B) 202.115.33.255　　(C) 202.115.35.255　　(D) 202.115.255.255

(17). An IP datagram of 5000 bytes arrives at a router and must be forwarded to a link with an MTU of 1500 bytes. Thus, the router has to fragment the datagram. To the last fragment, the value of offset should be _____.

　　(A) 4500　　　　　　(B) 4440　　　　　　(C) 563　　　　　　(D) 555

(18). With _____transmission, the nodes at both ends of a link may transmit packets at the same time.

　　(A) half-duplex　　　(B) full-duplex　　　(C) simplex　　　　(D) Synchronous

(19). There are two 16-bit integers: 1111 0000 1111 0000, 1001 1001 1001 1001. Their checksum is _____.

　　(A) 1000101010001001　　　　　　　　(B) 1000101010001010

　　(C) 0111010101110110　　　　　　　　(D) 0111010101110101

(20). For the data in (19), the CRC is applied to it with generator 1001. Thus, the CRC bits should be _____.

　　(A) 100　　　　　　(B) 110　　　　　　(C) 101　　　　　　(D) 011

评阅教师	得分

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

1	2	3	4	5	6	7	8	9	10

(1). If the traffic intensity is close to one, the average queuing delay will be close to zero.

(2). A web cache can reduce traffic on an institution's access link to the Internet.

(3). The timeout interval should be less than the connection's RTT.

(4). The MSS is the maximum amount of application-layer data in the segment.

(5). In slotted ALOHA, nodes can transmit at random time.

(6). Hubs can interconnect different LAN technologies.

(7). In the CSMA/CD protocol, the transmission delay Ttrans and the propagation delay Tprop must satisfy the condition T trans > T prop, in order that a node always detects a collision.

(8). An adapter's MAC address is dynamic

(9). In the three segments of the three-way handshake, the SYN bit must be set to 1

(10). In BGP, the NEXT-HOP attribute indicates the gateway address that has the highest traffic.

评阅教师	得分

3. please answer following questions briefly (30 points)

(1). Now assume that in the network shown in Figure 1 two parallel TCP transmissions are performed. TCP1 is a transmission between Source A and Sink A and TCP2 is a transmission between Source B and Sink B. Both TCP connections use TCP reno for congestion control. Assume that the MSS is 1KB and Initial ssthresh for both TCP transmissions is set to 32KB. Let's ignore the processing delay, the transmission delay and the queueing delay. Thus, the RTT is only composed of the sums of the delay indicated on each link, times two. Let cwndA and cwndB be the values of the congestion windows of Source A and Source B, respectively. At t=0, both Source A and Source B begin to transmission simultaneously.
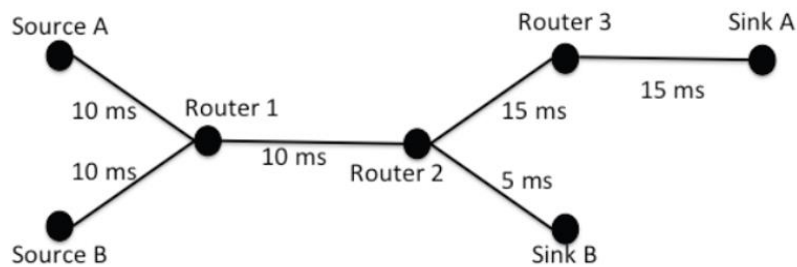

Figure 1.

   a) At t=100ms, what are the values of cwndA and cwndB, respectively? (2 points)

   b) At t=400ms, what are the values of cwndA and cwndB, respectively? (2 points)

   c) Let's assume the capacity of the link between Router1 and Router2 is 100KB/S. If there is no packet loss, when does this link stay busy all the time? (2 points)

   d) Assume that a timeout event is detected for TCP1 at t=500ms. At t=600ms, what are the value of cwndA and the value of ssthresh for TCP1? (2 points)

   e) Assume that an event of triple duplicate ACKs is detected for TCP2 at t=550ms. At t=600ms, what are the value of cwndB and the value of ssthresh for TCP2? (2 points)

(2). Consider the network scenario shown below. Client C1, servers S1 and S2, and routers R1 through R4 are all part of the same autonomous system (e.g., the SCU network) and are connected to other ASs in the rest of the Internet via router R4.
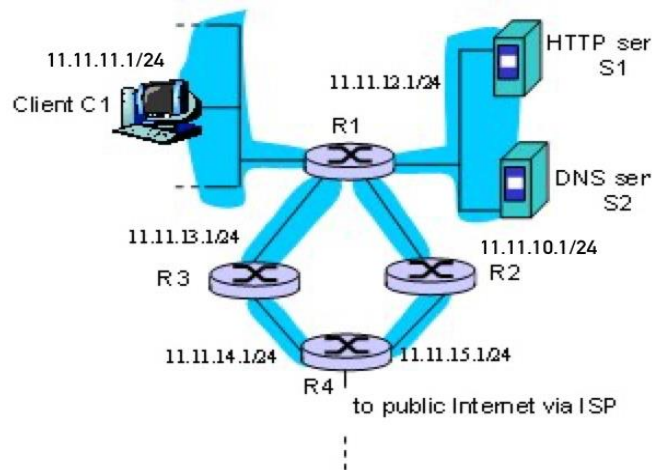
Figure 2

a) How many subnets in this AS? (1 points)

b) Suppose the user at C1 enters a URL into the browser for a document at S1 and refers to S1 by its name (e.g., S1.cs.scu.edu.cn). The document stored in S1 and returned to the user at C1 contains an embedded URL that is at another site that it outside the autonomous system shown above (e.g., www.remotesite.com). Which of the elements C1, S1, R1 – R4 will make a query to DNS server S2 to resolve the name www.remotesite.com. (2 points)

c) Which of C1, S1, S2, R1-R4 must be running the TCP protocol? Explain your answer. (3 points)

d) Which of C1, S1, S2, R1-R4 run an intra-domain routing protocol? (2 points)

e) What address prefix is advertised to ASs outside this network? (2 points)

(3). Suppose nodes A and B are on the same 1Gbps Ethernet bus, and the propagation delay between the two nodes is 200bit times. Assume that A and B each have one frame of 1000bits (including all headers and preambles) to send to each other. Let's assume that there on other nodes active. Suppose that A begins to sense the channel at time t=0 and B begins to sense the channel at time t=50bit times. Please answer the following questions with brief explanation.

a) At what time does A find the collision? (2 points)

b) At what time does B find the collision? (2 points)

c) Once the collision is found, A and B choose different values of K in the CSMA/CD algorithm. Let's assume Ka=0 and Kb=1. At what time does A begin to retransmit its frame? (2 points)

d) In the case of c), at what time does B sense the channel again? (2 points)

e) In the case of c), at what time does A receive the whole frame from B? (2 points)

评阅教师	得分

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

Consider a network in Figure 3, where two routers R1 and R2, two HUBs H1 and H2, and a switches S1, connect together. The numbers (1, or 2) besides the routers indicate their interfaces, and the IP addresses of each interfaces are shown as below. A DHCP server runs on the router R1. Initially, suppose all the ARP tables on each nodes are empty and the switching table on S1 is also empty.
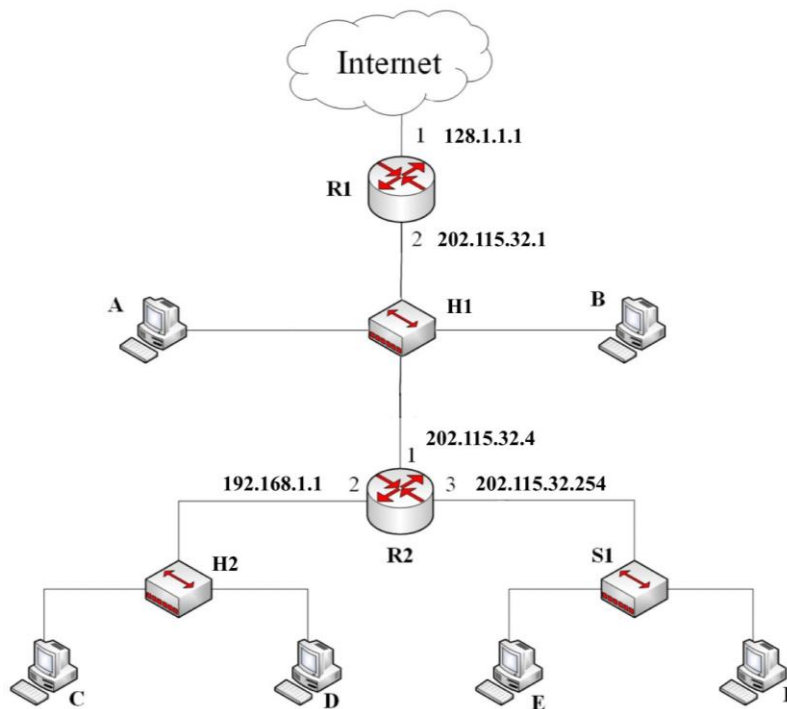

Figure 3

1) Please assign IP address ranges to the subnet containing hosts A and B, which should support 120 interfaces. (2 points)

2) Please assign IP addresses ranges to the subnet containing hosts E and F, which should support 120 interfaces. (2 points)

3) To make sure each host (from A to F) to access the Internet, what services has to be provided by R2? (2 points)

4) Suppose host E wants to send an IP datagram packet to host F. An ARP query has to be sent first due to the empty ARP table. Which of the nodes (hosts A-F, R1, R2) will receive this ARP query packet? (2 points)

5) After receiving the ARP query packet, host F sends an ARP reply packet. Which of the nodes (hosts A-F, R1, R2) will receive this ARP reply packet? (2 points)

6) Now suppose host C wants to send an IP datagram packet to host D. After performing the ARP query, host C will send a packet like below. Which of the nodes (hosts A-F, R1, R2) will

receive this datagram packet? (2 points)

The packet from C to D

Source MAC	Destination MAC	Source IP	Destination IP
C's MAC address	*D's MAC address*	*C's IP address*	*D's IP address*

7) Now suppose a new host (host G) is connected this network via the HUB H1. The host G has to send a DHCP discover message to request an IP address. Please list the source and destination MAC address and IP address in this DHCP discover message. (2 points)

The DHCP discover message

Source MAC	Destination MAC	Source IP	Destination IP

8) Once receiving this DHCP discover message, the DHCP server on R1 sends a DHCP offer message. Please list the source and destination MAC address and IP address in this DHCP offer message. (2 points)

The DHCP offer message

Source MAC	Destination MAC	Source IP	Destination IP

9) After sending one packet to host D, host C now wants to send a datagram packet to host A. Please list the source and destination MAC addresses and IP addresses for the frame C sent and the frame A received. (4 points)

The frame C sent

Source MAC	Destination MAC	Source IP	Destination IP

The frame A recieved

Source MAC	Destination MAC	Source IP	Destination IP