四川大学期末补缓考试题（闭卷）

（2019~2020 学年第 2 学期）

课程号：**304032030** 课程名称：**计算机网络**任课教师：吕光宏 朱敏 陈黎 杨朝斌 张靖宇 傅静涛

适用专业年级：　　学生人数：　　印题份数　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：

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答题纸和添卷纸上；

2. 请将答案全部填写在答题纸上；

3. 考试结束，请将试题、答题纸和添卷纸和草稿纸一并交给监考老师。

I. Acronyms Match the acronyms to the questions, using each acronym once: SYN, CDN, CIDR, CSMA, CSMA/CD, RTO, Flow Control, RIP, NAT, NIC, RFC, Policy Oscilations, RTT, TCP, Slow Start, TLD, TTL, Autonomous Systems ,UDP, WTF. (10 points,each 1 point). Not all acronyms are used.

1) Style of multiple access used by Ethernet. CSMA/CD

2) The time it takes a packet to reach the destination and have a response return. RTT

3) This lets several computes share a single IP address. NAT

4) The name of the message used to initiate a TCP connection. SYN

5) The length of time TCP waits for an acknowledgement before timing out and initiating a retransmission. RTO

6) A distance-vector routing protocol. RIP

7) Something that can happen in BGP that results in unstable routing tables. policy oscilations

8) The mechanism used by TCP to open up the congestion window quickly, and is used only if the connection is not operating in Congestion Avoidance. Slow Start

9) The entities that BGP provides routes between; BGP describes its paths in terms of a series of these. AS

10) A way of sharing a link's capacity among a group of senders in which each sender is assigned its own frequency to use when transmitting, which it can use to transmit whenever it pleases. FDMA

II. Single Choice (20 Points and each 2 points)

1) When IPv4 packets are fragmented, where does reassembly happen?

A) In the next-hop router　　B) In the next-hop switch

C) In the receiving end host　　D) In the textbook

2) Which of these fields is present in IPv4, but not in IPv6?

A) Source Address　　B) Destination Address

C) Fragmentation flags　　D) Next Header

3) The primary benefit of the narrow waist of the Internet is

A) Modularity　　B) Scalability

C) Interoperability　　D) Efficiency

4) Which of the following is true? The aggregation of multiple IP addresses into a single prefix

A) Increases the number of routing entries but simplifies the route lookup process

B) Reduces the number of routing entries and simplifies the route lookup process

C) Reduces the number of routing entries and has no effect on the route lookup process

D) Reduces the number of routing entries but complicates the route lookup process

5) Which of the following methods are ways a host can learn the netmask for the subnet?

A) ICMP　　B) ARP　　C) NAT　　D) Configuration

6) Host A is transferring a file to host B over a path with a RTT of 100ms and a bottleneck bandwidth of 100Kbps. A has a fixed sliding window of 1KBytes. Hence, the maximum throughput A can achieve to B (ignoring packet headers) is

A) 10Kbps　　B) 80Kbps　　C) 100Kbps　　D) 10/8 Kbps

7) Suppose a web page consists of a base HTMI file, 6 JEPG images and a java applet, and also suppose HTTP uses persistent connection without pipelining, the total response time is

A) 8RTT　　B) 9RTT　　C) 10RTT　　D) 16RTT

8) A single host can run multiple network application programs, e.g., a Web browser, an e-mail client, etc. How can different application programs running on the same host be uniquely identified?

A) Socket　　B) IP　　C) Port Number　　D) MAC

9) What is the host portion of the address 4.5.6.7 with mask 255.255.255.0?

A) 1100110010　　B) 00000111

C) 00001010　　D) 111000000

10) Consider an IP packet (without options) with total length 1500 bytes. The packet is split into fragments by a network that can only handle IP packets of up to 500 bytes. Which set of IP packet lengths could describe the set of fragments?

A) 500, 500, 500　　B) 400, 400, 400, 300

C) 420, 420, 420, 300　　D) 500, 500, 500, 60

III. Decide true or false. (10 Points, each 1 point)

1) It is possible to build a reliable file transfer application on top of UDP. F

2) Layering simplifies the development of applications. T

3) Layering trades off modularity for efficient implementations. T

4) Switches exhibit lower latency than routers. T

5) "Best effort" means packets are delivered to destinations as fast as possible. F

6) Poison-Reverse eliminates the counting-to-infinity problem. F

7) Packet switching requires routers to maintain state for each TCP connection. F

8) In TCP, a connection has to be closed by both sides at the same time. F

9) Traceroute program is a tool that can be used to determine the number of hops to a destination and the round trip time (RTT) for each hop. T

10) CIDR allocates IP addresses less efficiently than Classful Addressing. F

IV. Please Answer the following questions briefly. (30 points)

1.2 Alice邮箱服务器到Alice的客户端 Bob邮件服务器到Bob的客户端

1) Suppose that Alice wants to send an email message to Bob. This will involve four entities: Alice's mail client (for email composition and sending), Alice's outgoing mail server, Bob's incoming mail server, and Bob's mail client (for email retrieval and viewing). Between which of these four entities does the SMTP protocol operate? (2 points)What about the IMAP protocol? (2 points)

1.1 Alice的邮箱服务器到Bob的邮箱服务器

2) Consider a shared link L with five connections. Each connection is limited, by its own access link (which it uses to reach the shared link L), to the following bandwidths: Flow 1: 1Gbps Flow 2: 2Gbps Flow 3: 3Gbps Flow 4: 4Gbps Flow 5: 5Gbps

(1) If the shared link L has capacity C=10Gbps, what are the fair shares? (2 points) 1,2,7/3,7/3,7/3

(2) For which values of C (the capacity of the shared link) do flows 2 and 3 have the same fair shares? (2 points) C<=9

(3) For which values of C (the capacity of the shared link) do flows 4 and 5 have the same fair shares? (2 points)

(4) For which value(s) of C will flow 3 get 2.5Gbps? (2 points)

(5) If a particular flow gets less than its access bandwidth, does any flow receive more bandwidth than that flow? (2 points)

在公平分配原则下，如果一条链路的实际流量小于其接入网带宽，则这条链路的实际流量是共享链路可为单条链路分配的带宽的最大值。因此答案是否定的。

3) A router has the following (CIDR) entries in its routing table:

Address/ mask	Next hop
135.46.56.0/22	Interface 0
135.46.60.0/22	Interface 1
192.53.40.0/24	Interface 2
default	Interface 3

For each of the following IP addresses, how does the router forward a packet it receives with that address?

(a) 135.46.63.10　1　(2 points)

(b) 135.46.57.14　0　(2 points)

(c) 135.46.52.2　3　(2 points)

(d) 192.53.40.7　2　(2 points)

(e) 192.53.56.7　3　(2 points)

4) Consider your HTTP browser that wants to retrieve a Web document at http://www.scu.edu.cn/index.html. The IP address of the Web server is initially unknown. What application-layer protocols are needed in this scenario? (2 points) What transport protocols are needed to support those application-layer protocols? (4 points)

application-layers:http,dns
transport-layers:udp for dns,tcp for http

V. Comprehensive problems (30 points)

1) You have a sender and a receiver, Alice and Bob, connected by a path of Z links (and Z−1 switches), each with a link capacity of B bps and a propagation delay of 2ms. There are no queueing delays. The maximum packet size across this network is D bits, h of which are reserved for the header, leaving at most p for the payload (p = D−h). Alice wants to send an M-bit file to Bob. Assume M is evenly divisible by p.

(1) (4pts) Derive an equation showing how long it takes Alice to send an M-bit file to Bob over this network, assuming the network is packet-switched with store-and-forward switches.

$$\frac{MD}{PB} + (Z-1)*\frac{D}{B} + Z*0.002\text{seconds}$$

(2) (4pts) 'Cut through routing' is an alternative to store-and-forward where a

switch waits for the first h bits of a packet to arrive, and then begins transmitting the packet on the next link immediately (even if the last bits of the packet haven't arrived yet). Derive an equation showing how long it takes Alice to send an M-bit file to Bob over this network, assuming the network is packet-switched with cut-through switches.

$\frac{MD}{PB} + (Z-1) * \frac{h}{B} + Z * 0.002\text{seconds}$

(3) (4pts) Let's assume our network uses circuit switching. When Alice wants to send a file to Bob, she first sends one 'setup' packet of exactly k bits (for k < D, with k total bits in the packet including both header and payload) to B (requesting as much capacity as possible) and all of the switches act like normal store-and-forward switches. After Bob receives the setup packet, a 'circuit' has been established and the switches no longer use store-and-forward: a bit coming in on a switch immediately moves to the output port at the switch. Bob sends the k bit packet back to Alice, and then Alice is free to begin transmitting her file with no headers attached. Derive an equation showing how long it takes Alice to sends an M-bit file to Bob over this network, which is circuit switched.

$(Z+1)\frac{K}{B} + \frac{M}{B} + Z * 0.006\text{seconds}$

(4) (6pts) Let k=100 bytes, Z = 8, B = 50Mbps, D = 1550 bytes, and h = 50 bytes.

(a) (3pts) Which of the above networks will transmit a 3000 byte file fastest? astest? Cut-through routing.

(b) (3pts) Which of the above networks will transmit a 30MB file fastest? st? Circuit switching.

2) Consider the network in the following figure (on the next page), with ASes A, B, C, D. Each AS has some number of routers (labeled as A1, A2, etc.) and the domains are connected internally and with each other by the links depicted in the figure. Assume that eBGP and iBGP are used for interdomain routing, and that ASes A and D are using RIP for intradomain routing while ASes B and C are using OSPF for intradomain routing. Prefix x hangs off an interface on router C3.

(1) For the following answer, use one of these options:

a) OSPF　　b) RIP　　c) eBGP　　d) iBGP

(i) Router D3 learns about prefix x from which routing protocol? eBGP (1pt)

(ii) Router D1 learns about prefix x from which routing protocol? iBGP (1pt)

(iii) Router A3 learns about prefix x from which routing protocol? eBGP (1pt)

(iv) Router A1 learns how to reach router A3 from which routing protocol? RIP (1pt)

(v) Will router A1 use interface 1 or interface 2 to reach prefix x? interface 1 (1pt)

(2) Consider an interdomain network with domains A through F. For simplicity, assume that destinations in this problem are domains, not prefixes. Recall that routes are expressed in terms of the series of domains: e.g., [A-B-C] denotes a route that started with domain A and went to domain B and then to domain C (which is the

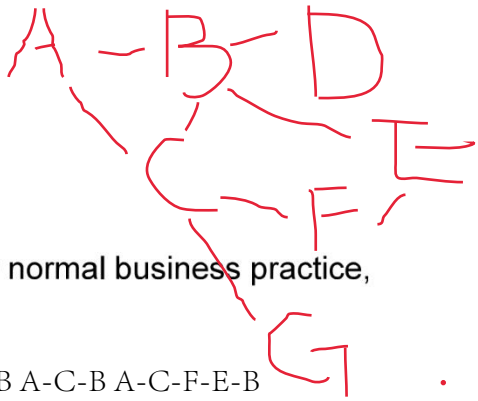
destination). Domains always advertise the route to themselves (i.e., domain X advertises the path [X] to all peers, customers, and providers). The following connectivity/business relationships exist:

B is a customer of A　　C is a customer of A

D is a customer of B　　E is a customer of B

F is a customer of C　　G is a customer of C

B and C are peers　　E and F are peers



Assuming that each domain's routing policies follow normal business practice, and that BGP has converged,

(i) What routes does A advertise to B? (1pt) A-B A-C-B A-C-F-E-B

(ii) What routes does C advertise to B? (1pt) C-B C-F-E-B

(iii) What routes does E advertise to B? (1pt) E-B

(iv) What routes does F advertise to E? (1pt) F-E F-C-B-E

(v) What path do packets from E take to F? (1pt) E-F

(vi) What path do packets from D take to F? (1pt) D-B-C-F

(vii) What path do packets from D take to G? (1pt) D-B-C-G