中山大学软件学院 **2009** 级软件工程专业 (2011 学年秋季学期)

《SE-301 计算机网络》期末试题 (A 卷)

(考试形式：闭 卷 考试时间：2 小时)

警示

《中山大学授予学士学位工作细则》第六条

考试作弊不授予学士学位

方向：_____ 姓名：_____ 学号：_____

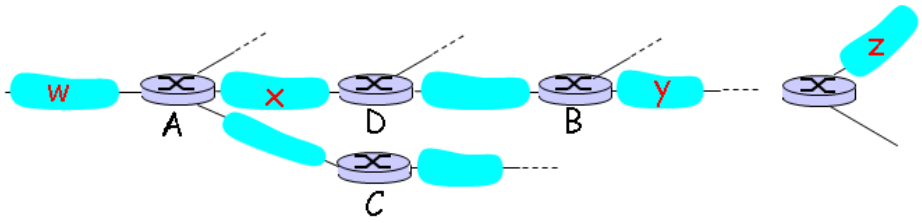
1. (12 points.) In this problem we consider sending real-time voice from Host A to Host B over packet-switched network (VoIP). Host A converts analog (模拟) voice to a digital 64 kbps bit stream (encode 编码) on the fly. Host A then groups the bits into 56-byte packets. There is one link between Host A and B; its transmission rate is 500 kbps and its propagation (传播) delay is 2 msec. As soon as Host A gathers a packet, it sends it to Host B. As soon as Host B receives an entire packet, it converts the packet's bits to an analog signal (decode 解码). How much time elapses (流逝) from the time a bit is created (from the original analog signal at Host A) until the bit is decoded (as part of the analog signal at Host B)? (Hints: 1 sec = 1000 msec, 1 k = 1000.)

2. (12 points) Suppose Alice, with a Web-based e-mail account (such as gmail), sends a message to Bob, who accesses his mail from his mail server using POP3. Discuss how the message gets from Alice's host to Bob's host. Be sure to list the series of application-layer protocols that are used to move the message between the two hosts.

3. (10 points) Consider transferring an enormous (非常大的) file of L bytes from Host A to Host B. Assume an MSS of 1,460 bytes.
   a) What is the maximum value of L such that TCP sequence numbers are not exhausted (用完的)? Recall that the TCP sequence number field has 4 bytes.(4 points)
   b) For the L you obtain in (a), find how long it takes to transmit the file. Assume that a total of 66 bytes of transport, network, and data-link header are added to each segment before the resulting packet is sent out over a 100 Mbps link. Ignore flow control and congestion (阻塞) control so A can send out the segments back to back and continuously.(6 points)

   (Hint: $2^{32} = 4,294,967,296 \approx 4.19$ Gbytes)

4. (12 points) Suppose there is an autonomous system (自治系统) using RIP protocol. Consider the following figure.



routing table in router D

destination subnet	next router	# hops to dest
w	A	2
y	B	2
z	B	7
x	--	1
….	….	….

Starting with the original table in D, suppose that D receives from A the following advertisement:

Destination Subnet	Next Router	# Hops to Destination
z	C	5
w	-	1
x	-	1
…	…	…

a) Brief explain the RIP protocol.(6 points)

b) Will the table in D changes? If so how?(6 points)

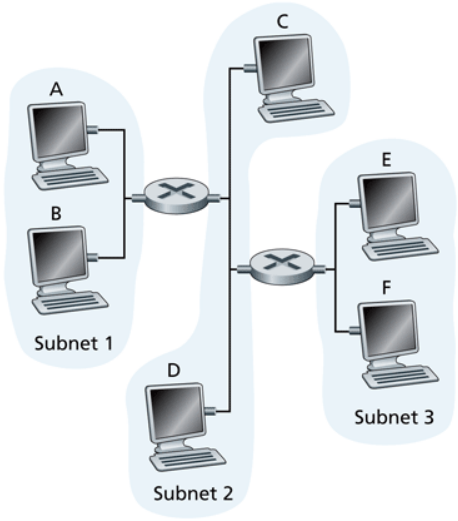
5. (12 points)Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 222.200.176/20. Also suppose that Subnet 1 is required to support up to 2000 interfaces, and Subnet 2 and 3 are each required to support up to 1000 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints.
(Hints: 2^{10}=1024, 2^{11}=2048, 2^{12}=4096, $176_{10}=10110000_2$)

6. (8 points) Consider the 4-bit generator (发生器), G=1011, and suppose that the data D has the value 11111010. What's the CRC value of R? Give the detailed calculation.

7. (16 points) I have a notebook computer. I bring it to the teaching building, and

power it on. Now I want to check the homepage of our school, ss.sysu.edu.cn, with Internet Explorer. Please explain from the **wireless router**'s (router that my machine will directly connect to, it is the WIFI AP device) **perspective** (视角), what kind of operation (**from application layer, if exist, down to data link layer**), the router must do to get the webpage to display. (Hint: You can focus on the router function of the AP device only)

8. (10 points)Consider the following figure.



Provide MAC addresses and IP addresses for the interfaces at Host A, both routers, and Host E. Suppose Host A sends a datagram to Host E. Give the source and destination MAC addresses in the frame encapsulating (封装) this IP datagram as the frame is transmitted

a) from A to the left router,
b) from the left router to the right router,
c) from the right router to E.

Also give the source and destination IP addresses in the IP datagram encapsulated within the frame at each of these points in time.

9. (8 points) What are the differences between wireless link to wired link? What additional problems do the multiple wireless senders and receivers create (beyond multiple access)?