中山大学软件学院 **2010** 级软件工程专业 (2012 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：_____

出卷：郑贵锋、张永民、田海博　　复核：_____

1. (12 points) Consider the circuit-switched network in Figure 1. There are **n** circuits on each link.
   a) How is data transferred through circuit-switched network? (6 points)
   b) What is the maximum number of simultaneous connections that can be in progress at any one time in this network? (3 points)
   c) Suppose that all connections are between the switch in the upper-left-hand corner and the switch in the lower-right-hand corner. What is the maximum number of simultaneous connections that can be in progress? (3 points)

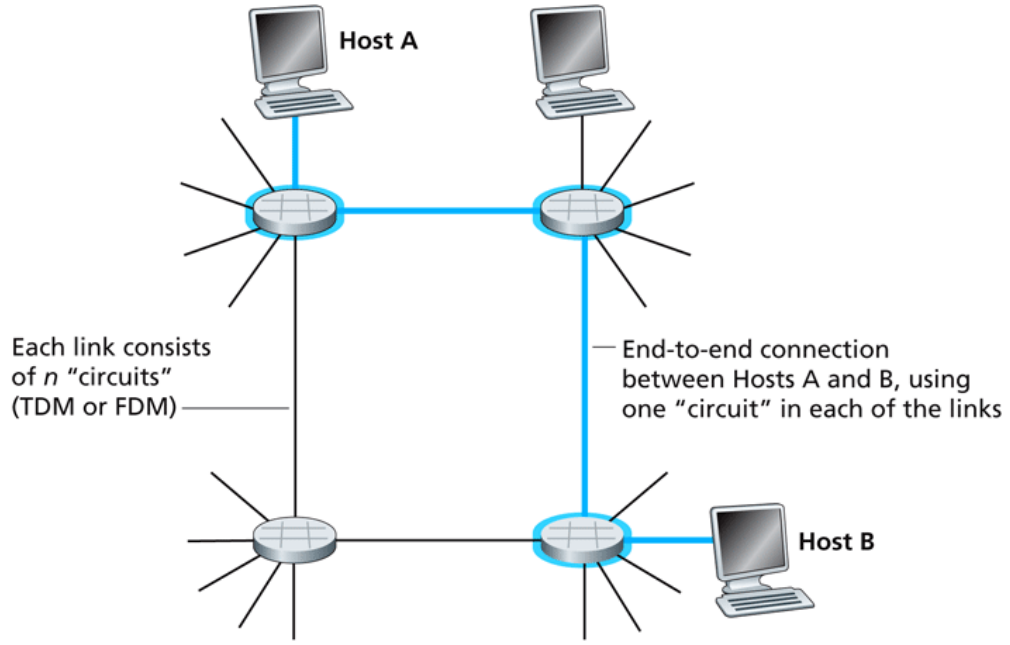


Figure 1. A simple circuit-switched network consisting of 4 switches and 4 links.

2. (16 points) Suppose within your web browser you click on a link to obtain a web page. Suppose that the IP address for the associated URL is not cached in your local host, so that a DNS look up is necessary to obtain the IP address. Suppose that n DNS servers are visited before your host receives the IP address from DNS; the successive visits incur a RTT of RTT_1, ..., RTT_n. Further suppose that web page associated with the link contains exactly one object, a small amount of HTML text. Let RTT_0 denote the RTT between the local host and the server containing the object. Assuming zero transmission time of the object.

   Note: Explain your answer!

   a) How much time elapses from when the client clicks on the link until the client receives the object. (8 points)

   b) Suppose the HTML file references four very small objects on the same server. Neglecting transmission times, how much time elapses with **non-persistent** HTTP with no parallel TCP connections? (4 points)

   c) Suppose the HTML file references four very small objects on the same server. Neglecting transmission times, how much time elapses with **Persistent** HTTP with no parallel TCP connections? (4 points)

3. (8 points) True or false?

   a) A transport-layer protocol provides logical communication between processes running on different hosts; a network-layer communication provides logical communication between hosts.

   b) Suppose Host A is sending Host B a large file over a TCP connection. If the sequence number for a segment of this connect is m, then the sequent number for the subsequent segment will necessarily be m+1.

   c) With Selective Repeat protocol, it is possible for the sender to receive an ACK for a packet that fall outside of its current window.

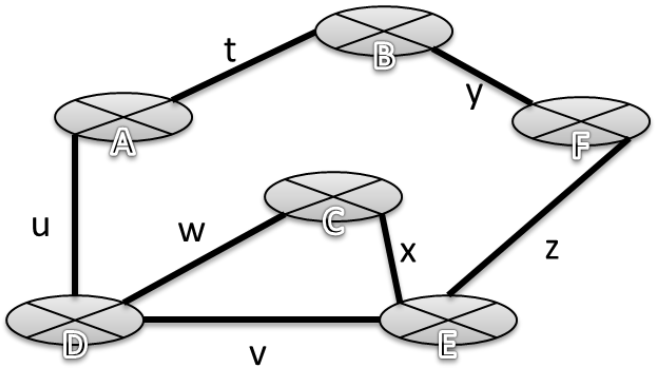
   d) It is impossible for an application to enjoy reliable data transfer even when the application runs over UDP.

4. (10 points) Consider sending a large file from a host to another over a TCP connection that has no loss.

   a) Suppose TCP uses AIMD for its congestion control without slow start. Assuming **cwnd** (congestion window, 阻塞窗口) increases by 1 MSS (Maximum Segment Size) every time a batch of ACKs is received and assuming approximately constant round-trip times (RTT), how long does it take for cwnd increase from 5 MSS to 11 MSS (assuming no loss events)? (4 points)

   b) What is the average throughout (in terms of MSS / RTT) for this connection up through time = 6 RTT? (6 points)

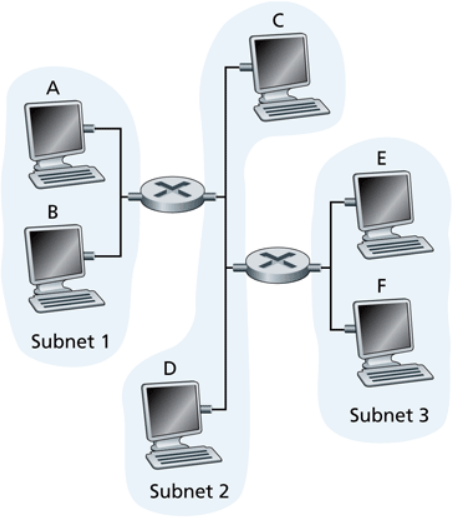
5. (16 points) Consider the network shown below, and assume that each node initially knows the costs to each of its neighbors. Consider the routers are using the RIP protocol, answer the following questions:



a) What algorithm does RIP protocol based on? Describe how it works in the Internet (6 points)
b) Show the initial routing table entries at time T_0 in router D. (4 points)
c) Show the routing table entries at time T_0+63 seconds in router D. (6 points)

6. (10 points) Consider sending a 2400-bytes datagram into a link that has an MTU of 700 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation?

7. (16 points) Consider the following figure.



Now we replace the router between subnets 1 and 2 with a switch S1, and label the router between subnets 2 and 3 as R1.

a) Consider sending an IP datagram from Host E to Host F. will Host E ask router R1 to help forward the datagram? Why? In the Ethernet frame containing the IP datagram, what are the source and destination IP and MAC addresses? (8 points)

b) 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. Further suppose that the switch S1's forwarding table contains entries for Host B and router R1 only. Thus, A will broadcast an ARP request message. What actions will switch S1 perform once it receives the ARP request message? Will router R1 also receive this ARP request message? If so, will R1 forward the message to Subnet 3? Once 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? What will switch S1 do once it receives an ARP response message from Host B? (8 points).

8. (12 points) Answer the following questions about Ethernet:

a) Explain CSMA/CD protocol, and how it backs off when conflicts happen.(6 points)

b) In CSMA/CD, after the 6th collision, what is the probability that a node chooses K = 5? The result K = 5 corresponds to a delay of how many seconds on a 10 Mbps Ethernet (a bit time is 0.1 microsecond) ? (6 points)

----The End----