# COMP 361 Computer Communication Networks

## Summer Semester 1998

## Final Examination

Date: August 10, 1998 Time: 9am- 12pm

Name:__________________________ Student ID:________________ Email: __________

## Instructions:

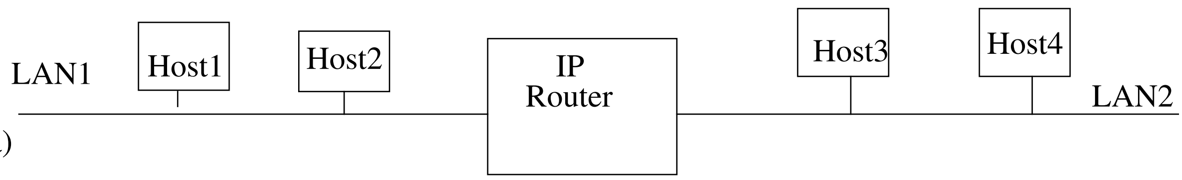
1. This examination paper consists of 7 pages and 8 questions.
2. Please write your name, student ID and Email on this page.
3. For each subsequent page, please write your student ID at the top of the page in the space provided.
4. Please answer all the questions within the space provided on the examination paper. You may use the back of the pages for your rough work.
5. Please read *each question very carefully* and answer the question clearly and to the point. Make sure that your answers are neatly written, readable and legible.
6. Show all the steps you use in deriving your answer, wherever appropriate.
7. For each of the questions assume that the concepts are known to the graders. Concentrate on answering to the point what is asked. Do not define or describe the concepts.

| Question | Points | Score |
|---|---|---|
| 1 | 10 | |
| 2 | 10 | |
| 3 | 20 | |
| 4 | 10 | |
| 5 | 10 | |
| 6 | 15 | |
| 7 | 15 | |
| 8 | 10 | |
| TOTAL | 100 | |

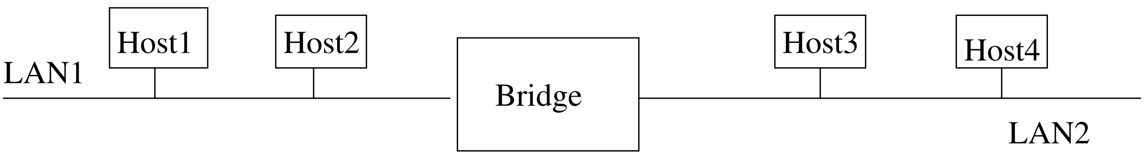
1. Answer the following true/false questions by circling either T or F. (10 points)
   a) IP datagram is transmitted as the payload of frame on the physical network T F
   b) AAL5 has more overhead in the cell format than the AAL3/4 T F
   c) ATM cell size is 53 bytes T F
   d) Spanning tree algorithm is needed to prevent loops in extended LANs obtained by interconnecting LANs with bridges. T F
   e) The root bridge in the spanning tree algorithm has the greates ID among all the bridges in the extended LAN. T F
   f) If bridge becomes congested it may drop frames. T F
   g) Internet Control Message protocol is used to carry user data T F
   h) Routing Information Protocol uses link-state routing. T F
   i) Domain Name System uses hierarchical name space. T F
   j) Three-way handshake in the TCP is used to prevent old packets from creating confusion in the initialization process of the connection T F

2. Consider the following pictures assuming that every host is runnung TCP/IP protocol suite:

a)




b)




Suppose that TCP application running on the Host1 wants to communicate with TCP application running on the Host_2. The IP protocol on Host_1 uses ARP protocol to get Host_2's physical address.

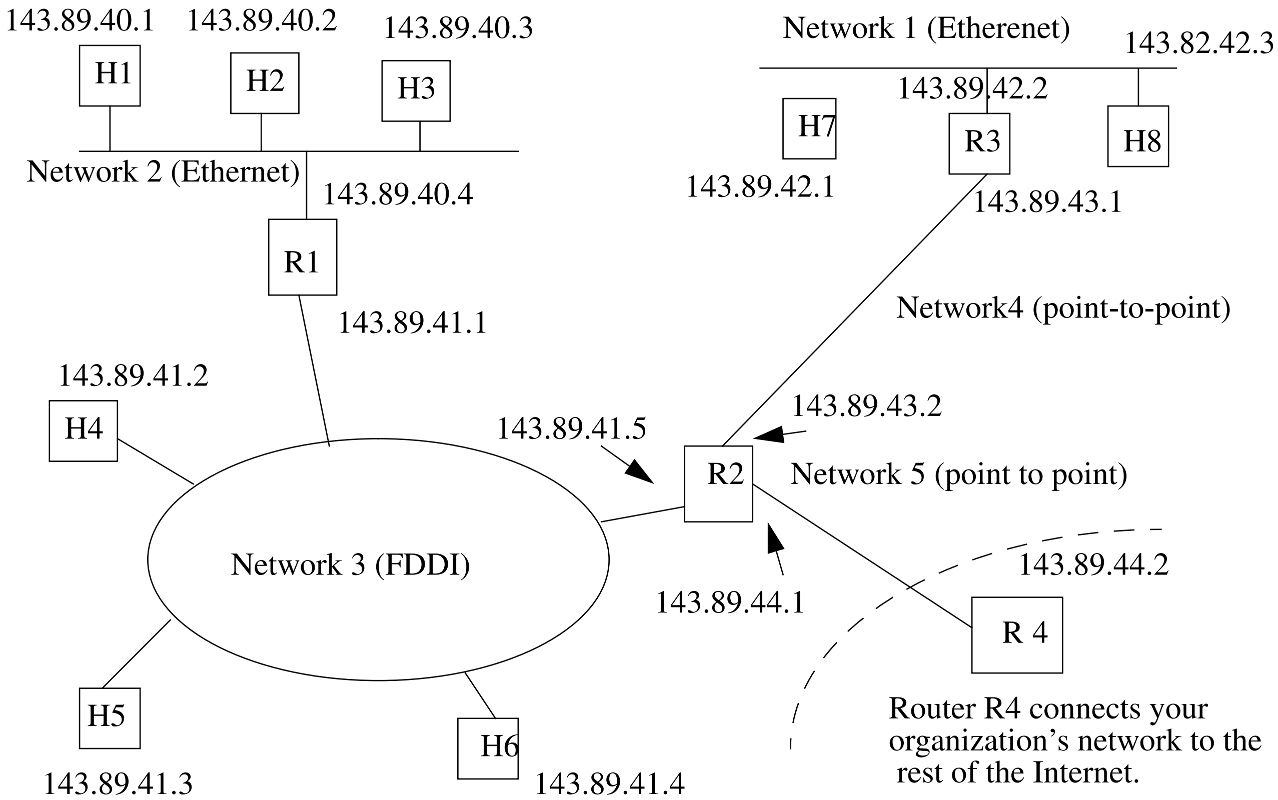
i) Can Host_3 and Host_4 hear about ARP executed between Host_1 and Host_2 in figure (a)? Why ? (5 points)

No, IP router will filter out ARP querry.

ii) Can Host_3 and Host_4 hear about the ARP executed between Host_1 and Host_2 in figure (b) ? Why ?(5points)

Yes, ARP is executed as the broadcast in the LAN and bridge is passing broadcsasts in the extneded LAN.

3. Suppose that you are given class B IP network address (143.89), subnet mask 255.255.255.0, and 5 8-bit subnet numbers in the range from 40 to 44 to design internetworking structure in your organization with the following networking toplogy. Assign IP addresses to all the nodes in the network. Nodes are denoted as Hi for hosts and Ri for routers..(20 points)



4. The user dtagram protocol (UDP) provides an unreliable connection service. This service is already provided by the underlying IP layer ? What are the additional features provided by the UDP that makes the protocol interesting. Why can't a user program directly access IP ?(10 points)

Answer:UDP provides multiplexing of application processes allowing them to share the network services. It achieves so by having process acces points to the UDP , i.e. protocol ports..

On the other hand , IP does not support process multiplexing /demultiplexing and it can not be accessed directly by the application process

5. TCP protocol uses sliding window algorithm. When the segment with acknowledgement is sent back from the receiver to the sender, what is the information related to the operation of the sliding window which must be sent to the sender? Which important functions are supported by the TCP's sliding window protocol ? (10 points)

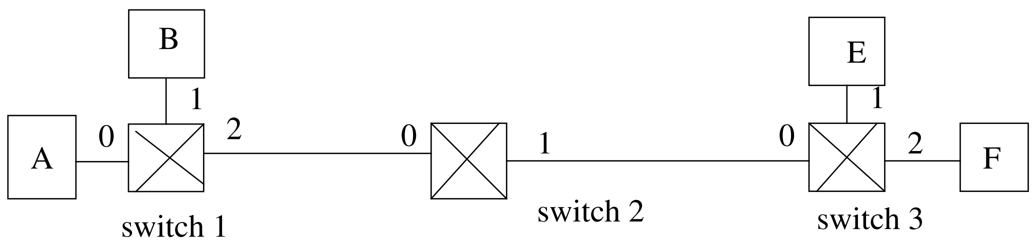
Answer: Fields Acknowledgement and AdvertisedWindow are important for the operation of the sliding window protocol in TCP. Ack. filed carries the sequence number of the next expected byte. AdvertisedWindow carries the amount of the free buffer space at the receiver

TCP's sliding window protocl ensures:

1) guranteed data delivery (no packet loss)
2) ordered (sequenced) data delivery (no duplicates)
3) flow control

6. Consider the following virtual circuit network . Fill the virtual circuit tables for all the switches after each of the following connections is established. Assume that the sequence of connections is cumulative , that is the first connection is still up when the second connection is established, and so on. Also assume the the VCI assignment always picks the lowest unused VCI on an outgoing link. Assume that connections are bidirectional. (15 points)

a) host A connects to F (and there is a connection from F to A)
c) host B connects to E (and there is a connection from E to B)




| Switch 1, Port 0_ | | | |
|---|---|---|---|
| IN_Port | IN VCI | OUT Port | OUT VCI |
| | | | |

| Switch 1, Port 1_ | | | |
|---|---|---|---|
| IN_Port | IN VCI | OUT Port | OUT VCI |
| | | | |

| Switch 1, Port 2_ | | | |
|---|---|---|---|
| IN_Port | IN VCI | OUT Port | OUT VCI |
| | | | |

| Switch 2, Port 0_ | | | |
|---|---|---|---|
| IN_Port | IN VCI | OUT Port | OUT VCI |
| | | | |

| Switch 2 , Port 1_ | | | |
|---|---|---|---|
| IN_Port | IN VCI | OUT Port | OUT VCI |
| | | | |

| Switch 3, Port 0_ | | | |
|---|---|---|---|
| IN_Port | IN VCI | OUT Port | OUT VCI |
| | | | |

| Switch 3, Port 1_ | | | |
|---|---|---|---|
| IN_Port | IN VCI | OUT Port | OUT VCI |
| | | | |

| Switch 3, Port 2_ | | | |
|---|---|---|---|
| IN_Port | IN VCI | OUT Port | OUT VCI |
| | | | |

7. Timed token protocol is to be used to control access to a three-station FDDI network. All frames to be transmitted are of the same length and the TTRT to be used is equivalent to the transmission of three frames plus any ring latency. After an idle period (denoted as token rotation 0 in the table) when no frames are ready to send, all three stations receive three frames to send. Assuming the time for the token to rotate around the ring in the idle state is equal to the time to transmit the token Tt, plus ring latency Tl, derive and show in the table form the number of frames each station can transmit for the next three rotations of token. Assume that situation when TRT= TTRT is considered as the late token. (15 points)

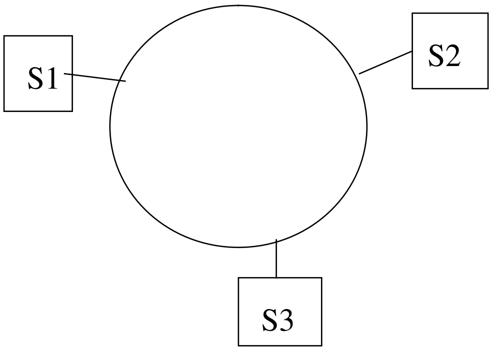



**Table 1:**

| Token rotation | Station 1 TRT | Number of frames sent by Station 1 | Station 2 TRT | Number of frames sent by Station 2 | Station 3 TRT | Number of frames sent by station 3 |
|---|---|---|---|---|---|---|
| 0 | Tt +Tl | 0 | Tt+Tl | 0 | Tt+Tl | 0 |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |

8. The IP datagram for a TCP ACK message is 40 bytes long: it contains 20bytes of TCP header and 20 bytes of IP header. Assume that this acknowledge is traversing an ATM network that uses AAL5 to encapsulate IP packets. The format of the ATM adaptation layer 5 packet (protocol data unit - PDU) is given in the following picture. How many ATM cells will it take to carry the ACK ? Hint: what is the length of the Pad field in this case? (10 points)

| < 64 KB | 0-47bytes | 2 bytes | 2 bytes | 4 bytes |
|---|---|---|---|---|
| DATA | Pad | reserved | Length of the PDU | CRC |

Answer: It will take one cell only since Pad will 0 bytes long. In this case AAL5 PDU length will be 48 bytes only, and it will be put in one ATM cell.