

# CIS 410 Computer Networks Final- Spring 20

Name:

Total : 70 points

### Application Layer:

1. [3 pts] Describe one advantage and one disadvantage packet-switched networks have over a circuit-switched networks.
2. [3 pts] What are the two types of network application architectures?
3. [3 pts] Name a tool (or utility) that can be used to measure delay in the Internet.

4. [4 points] Consider sending a packet from a sending host to a receiving host over a fixed route. List the delay components in the end-to-end delay computation. Considering a fixed packet size, which of these delays are constant and which are variable.
5. [6 points] Is the average queueing delay small or large at a network link with a link rate of 110 Mb/s, an arriving traffic rate of 9,800 packets per second with average packet length of 1300 bytes. Show your calculations for partial credit.

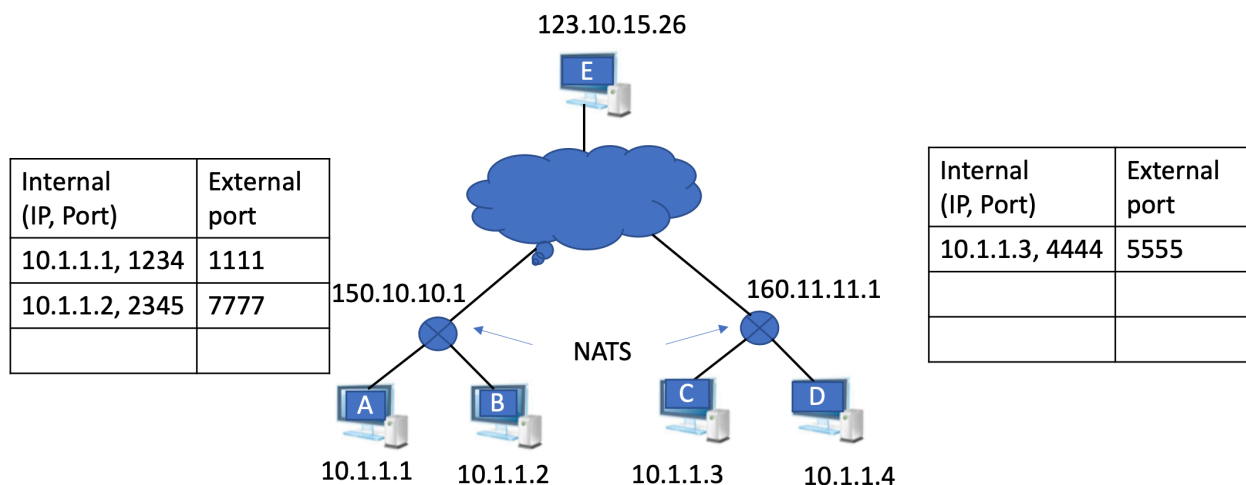
### Transport Layer:

1. [3 pts] Describe how a tcp connection is established between a sender and a receiver? what are the packets sent by sender/reciever? Draw a diagram showing the exchange of packets between sender and receiver.
2. [2 pts] What is the minimum value for the timeout of a reliable transmission protocol? Why?
3. [4 pts] What is the difference between congestion control and flow control? How does the sender control the flow? Be specific.

## Network Layer:

1. [3 pts] What is DNS? Describe what it does and (at a very high level) how it works.

2. [4 points] The figure below shows two networks with routers that implement NAT and their network translation tables. Suppose host A is connected to host E



a. Show the values of address and port fields in the datagram below for a packet sent from A to E

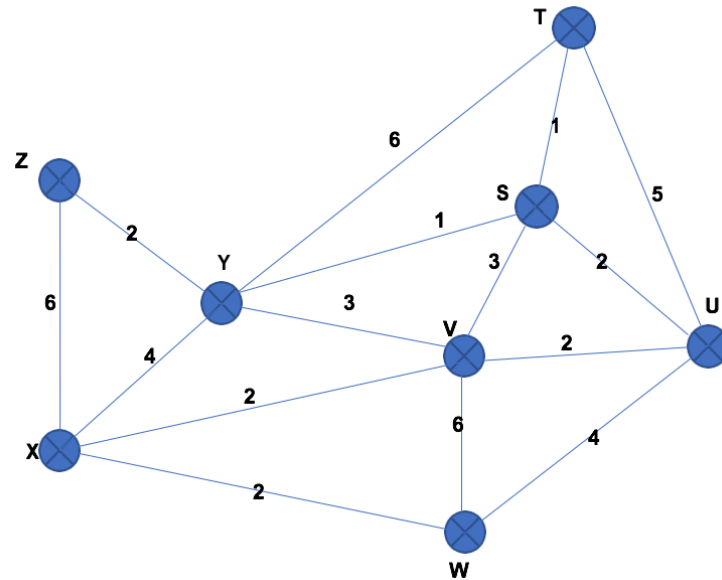
Source Address	Destination Address	Source Port	Destination Port

b. Show the fields of the packets as it might appear when it reaches E

Source Address	Destination Address	Source Port	Destination Port

3. [4 pts] What is INTER AS routing and INTRA AS routing? Why use different routing protocols for INTER and INTRA AS routing?
4. [3 pts] Why does distance-vector routing scale better than link-state routing? Be specific.

5. [9 pts] Consider the following network. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from Z to all network nodes. Show how the algorithm works by computing a table. Once completed redraw the topology by removing the links that are not needed.



Step	N'	D(X),p(X)	D(Y),p(Y)	D(V),p(V)	D(W),p(W)	D(S),p(S)	D(T),p(T)	D(U),p(U)
0								
1								
2								
3								
4								
5								
6								
7								
8								

### Link Layer:

1. [4 pts] Describe CSMA/CD and Binary Exponential Backoff as used in IEEE 802.3 Ethernet.
2. [3 pts] What are the four ways to share a channel?
3. [3 pts] What is the purpose of ARP? Describe how ARP works.

4. [3 pts] Briefly describe how the traceroute tool works (i.e., what does it do in order to identify the routers that make up an Internet path).
5. [6 pts] Given a 6-bit message  $M = 111011$  and a 4-bit generator  $G = 1010$ , compute the CRC and give the frame  $T$  to be transmitted.