

Name _____ KEY _____

**CS3516 B14
Computer Networks
Mid Term Exam
November 20, 2014**

Question	Points	Score
0	1	
1	5	
2	3	
3	4	
4	5	
5	3	
6	4	
7	5	
8	2	
9	6	
10	4	
11	6	
12	6	
13	9	
14	18	
Total	80	

Trivia Question (1 extra credit point)

0. (a) What is the capital of **Sierra Leone**?

Freetown

-OR-

(b) What city will host the **Republican National Convention** in **2016**?

Cleveland, Ohio

(5 pts.) 1. What is a **network protocol** and what does a **network protocol** define?

Protocols govern the rules by which two or more remote peer processes communicate.

Protocols define: the format, the order of msgs sent and received among network entities, and the actions taken on message transmission and receipt.

(3 pts.) 2. Explain the role and issues envisioned in the **OSI Reference Model** for the **Session Layer**.

The session layer provides the control structure for communicating between applications. It establishes, manages and terminates session connections between cooperating applications.

Session layer concerned with synchronization, checkpointing and error checking

(4 pts.) 3. Explain the relationship between the **listen** system call and the **accept** system call on a server using TCP sockets on a UNIX/Linux system.

listen is called only by a TCP server and performs two actions:

- 1. Converts an unconnected socket (*sockfd*) into a passive socket.**
- 2. Specifies the maximum number of connections (*backlog*) that the kernel should queue for this socket.**

listen is normally called before the accept function.

accept is called by the TCP server to return the next completed connection from the front of the completed connection queue.

(5 pts.) 4. Explain the difference between **datagram** and **virtual circuit routing**.

Datagram Routing

Each datagram packet may be individually routed.

Packets from same flow may take different routes to the destination node.

Virtual Circuit Routing

In virtual circuit, a set up is required.

All packets in a virtual circuit follow the same path through the network.

(3 pts.) 5. Name the three standard approaches used to conduct **network performance evaluation**.

Analytic modeling, simulation and empirical (running experiments)

(4 pts.) 6. Explain how the **modulation rate** and **channel capacity** can be different for a signal traveling over a wired medium.

You can have more than one modulation (signal change per bit). OR

The signal is encoded such that one change in modulation signal can represent multiple bits.

(5 pts.) 7. Draw a diagram and explain the role of **statistical multiplexing** in a **concentrator**.

(2 pts.) 8. What is the **minimal acceptable** wiring grade for **twisted pair** today?

Category 5e

(6 pts.) 9. Discuss the differences between **ADSL** and **VDSL**.

(4 pts.) 10. Explain the difference between **PON** and **AON** when using fiber to communicate to a home.

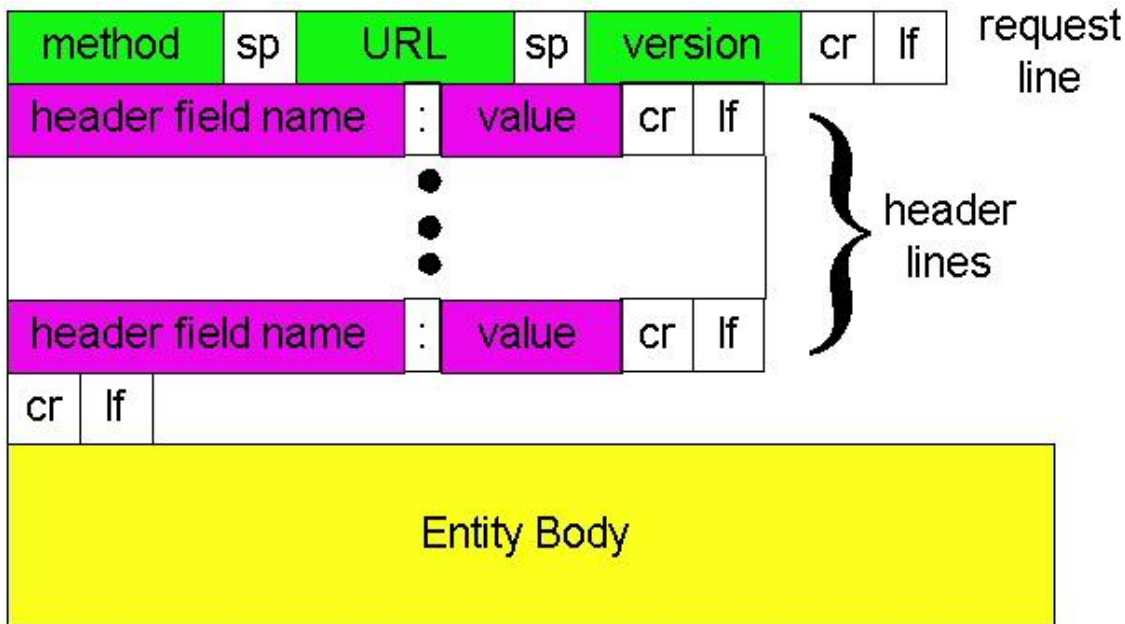
AON Active Optical Network

- Uses electrical powered switches
- More range
- Less reliable

PON Passive Optical Network

- Optical splitters do not need electrical power.
- Hard to isolate failure
- Transmission speed may be slower during peak hours.

(6 pts.) 11. Draw a diagram that shows the general format of an **HTTP request message** and discuss the order and the content of the lines in the request message.



(6 pts.) 12. What is a **cookie**? How are cookies helpful? What potential harm can they cause to the user of a web browser?

Cookies are parts of HTTP messages containing state. This state information allows sites to keep track of users. Server sites create user ids which are passed back and retained by user's browser.

They can be used to create a user session layer on top of stateless HTTP.

They can simplify the user experience at the server.

As servers learn about the user it can become an invasion of privacy.

(9 pts.) 13. Name and discuss the roles of the top three levels of servers in the **DNS** distributed hierarchy.

1. **Root name server:**
Contacts authoritative name server if name mapping not known.
Gets mapping.
Returns mapping to local name server.
2. **Top-level domain (TLD) servers:**
Responsible for com, org, net, edu, etc, and all top-level country domains such as uk, fr, ca and jp.
3. **Authoritative DNS servers:**
Organization's DNS servers, providing authoritative hostname to IP mappings for organization's servers (e.g., Web, mail).
Can be maintained by organization or service provider.

(18 pts.) 14. Given the **internet** pictured below with a propagation speed of **200m/microsec** on the packet-switched WAN and **150 m/microsec** on the **counter-clockwise 10 Mbps** ring LAN where the five nodes (A, B, C, D, E) are equidistantly spaced **300 meters** apart. Assume that every frame on the token ring incurs a **one-bit delay** when it passes through each node repeater.

Nodes 1-4, 7, 8 and E are equidistantly spaced **6 km** apart on the WAN with **1 Gbps** links between nodes. Node E is the only WAN node with a processing time of **100 milliseconds**.

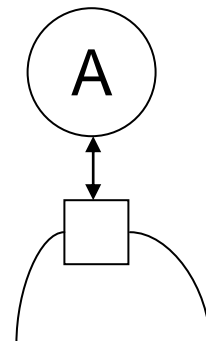
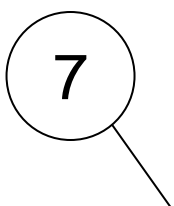
Assuming one packet fits exactly into one frame payload and given the following frame specifications:

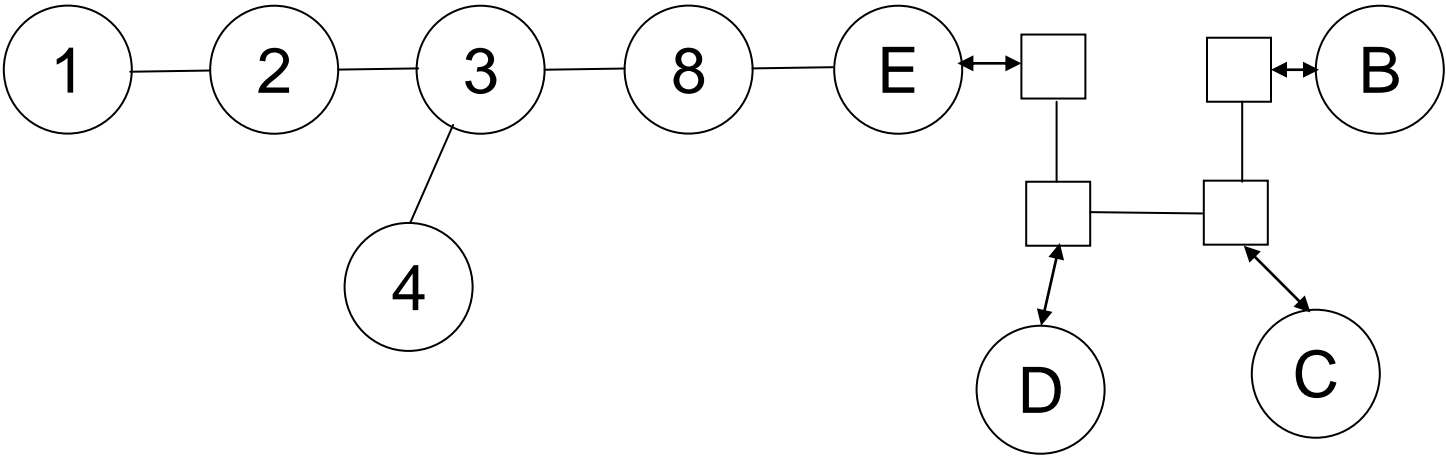
Frame payload = **1170 bytes**

Frame header = **40 bytes** Frame trailer = **40 bytes**

a. How long will it take to send a packet from **node D** to **node 1** in the situation that when the packet arrives at **node 2** there are three packets waiting to go to **node 1** and two packets waiting to go to **node 7**? Assume no other queuing on the WAN and that the transmitting node has the token.

{List any assumptions made and show **ALL** work to receive full and/or partial credit.}





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