CS 6380 Computer Networks **Fall Quarter, 1997**

Final Examination

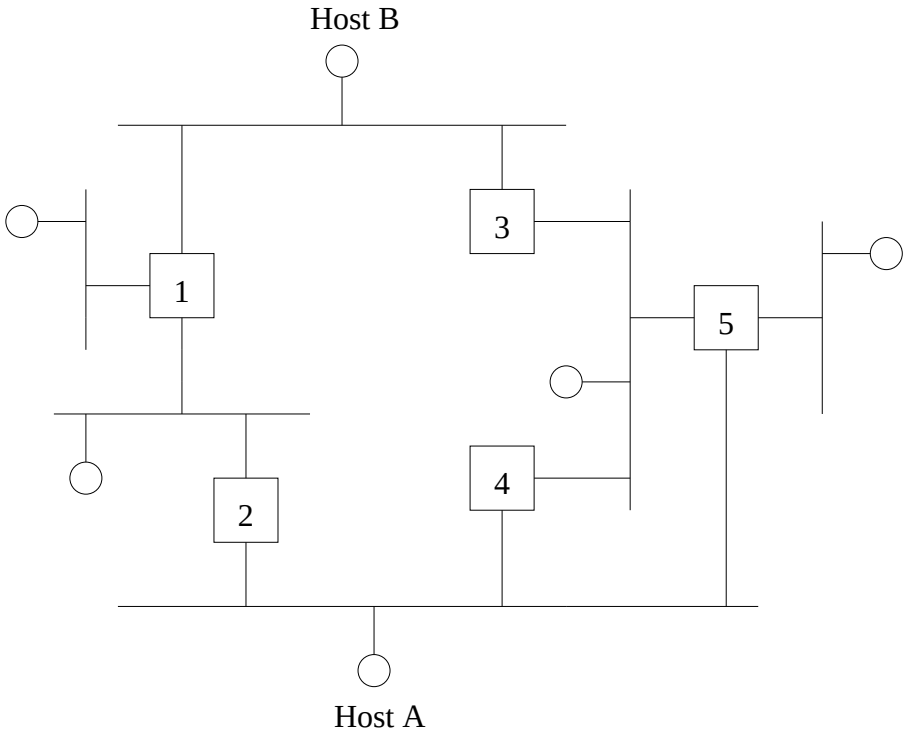
December 11

Be neat and concise. Show your work. Good luck!

Name: _____

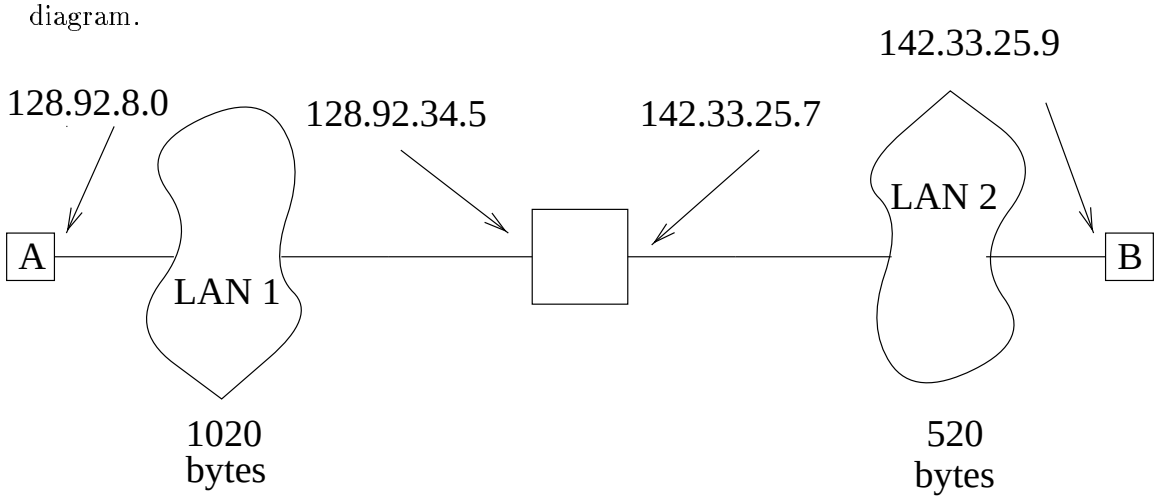
Problem	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
Total	80	

1. **Bridges.** On the bridge-LAN topology shown below, mark each bridge port as Root (R), Designated (D) or Blocked (B) assuming that the spanning tree algorithm described in class is used. Show the path of a frame that originates at Host A and is destined for Host B.



2. **Routing.** Does the Internet use shortest-path routing? Explain.

3. **IP.** Suppose an IP packet with 1200 bytes of data and 20 bytes of header is generated at station A, destined for station B. The IP addresses of the interfaces are indicated in the diagram. The largest transmission unit of each local area network (LAN) is indicated in the diagram.



(a) Give the source and destination IP addresses in the packet (or packet fragments) as it traverses LAN 2.

(b) Give the number of fragments, the size of each fragment, and the value in the fragment offset field for the fragments traversing LAN 2. (Use as many rows of the table below as you need.)

Fragment number	Size (in bytes)	Offset
0		
1		
2		
3		
4		
5		

4. **TCP.** Just as in data link layer ARQ protocols, TCP will also use a timeout to trigger a retransmission. To determine the value for the timer, TCP must estimate the round trip time to the receiver. This is accomplished by using measurements of round trip time based on "pairing up" packet transmissions and acknowledgements.

   (a) Explain why TCP uses measurements of round trip time, while data link layer protocols do not need to do this.

   (b) TCP only uses measurements involving *original* transmissions, not *retransmissions*, to estimate round trip time. Using a timing diagram, illustrate why retransmissions are not used.

5. **ALOHA.** Consider an ALOHA channel that can accomodate *two* packets simultaneously, however if *three* packets are transmitted at the same time then a collision occurs.

   (a) Derive an expression for the throughput of this new version of ALOHA without slotting, assuming a Poisson packet generation process (as in class).

   (b) What is the maximum throughput?

6. **Coding.** Consider a coding scheme that is similar to a checksum. Specifically, it operates on data that is a multiple of 8 bits. It "lines up" the data into rows, with one 8-bit word per row, then takes the exclusive OR, producing a 8-bit checksum value.

   (a) What is the Hamming distance of this code? Give two codewords that illustrate the Hamming distance.

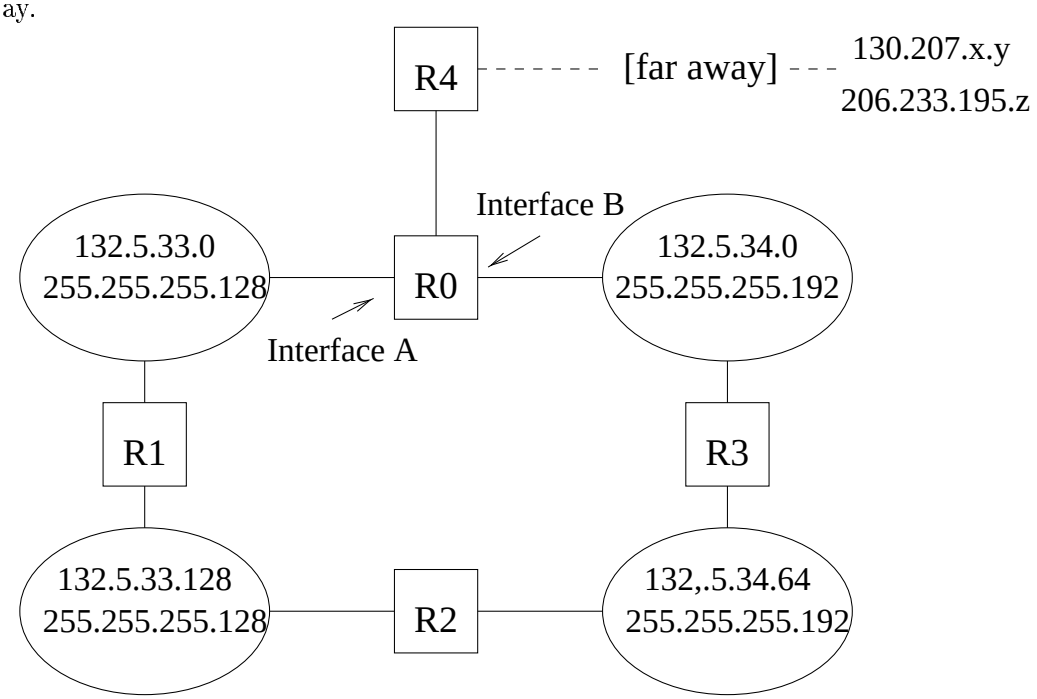
   (b) What are the *complete* error detection and correction capabilities?

7. **TCP.** Assume the maximum segment size is 1000 bytes. Give the value of the TCP sending window under the following conditions:

   (a) Current congestion window = 4000 bytes; slow start regime; just received acknowledgement with window field of 5000 bytes.

   (b) Current congestion window = 4000 bytes; additive increase regime; just received acknowledgement with window field of 5000 bytes.

8. **Subnets and Routing.** A network manager has configured an autonomous system using subnets, as depicted below. Each oval represents a physical network, with the subnet number above the subnet mask. Two other logical networks (130.207.x.y and 206.233.195.z) are far away.



(a) Has the manager made any mistakes in creating subnets? Explain how you verify this.

(b) Assuming no errors in subnetting, show the contents of the routing table at router R0.