CS 4850/7850 Final Exam May 14, 2020

Tally Sheet:

Problem	Max Score	Your Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

Problem 1 (20 points). Suppose a router has built up the routing table shown below. The router can deliver packets directly over interfaces 0 and 1, or it can forward packets to routers R2, R3, or R4. **Assume the router does the longest prefix match**.

SubnetNumber	SubnetMask	NextHop
128.96.64.0	255.255.192.0	Interface 0
128.96.96.0	255.255.224.0	Interface 1
128.96.80.0	255.255.240.0	R2
128.96.88.0	255.255.248.0	R3
default		R4

Which next hop will the router choose for an incoming packet addressed to each of the following destinations:

a) 128.96.127.27 => Interface 1

b) 128.96.95.55 => R3

c) 128.96.80.67 => R2

d) 128.96.72.128 => Interface 0

e) 128.96.128.53 => R4

Problem 2 (20 points). Consider the following routing table using CIDR. Address bytes are in hexadecimal. The notation “/12” in C4.50.0.0/12 denotes a netmask with 12 leading 1 bits: FF.F0.0.0. Note that the last three entries cover every address and thus serve in lieu of a default route. **Assume the router does the longest prefix match**.

Net/Mask Length	**Nexthop**
C4.50.0.0/12	A
C4.5E.80.0/17	B
C4.5E.C0.0/18	C
C4.5E.E0.0/19	D
80.0.0.0/1	E
40.0.0.0/2	F
00.0.0.0/2	G

State to what next hop packets with the following destination addresses will be delivered:

Destination Address	**Nexthop**
C4.5E.D3.87	C
C4.50.22.09	A
C4.5E.F4.80	D
C4.5E.99.15	B
C4.5E.B9.10	B

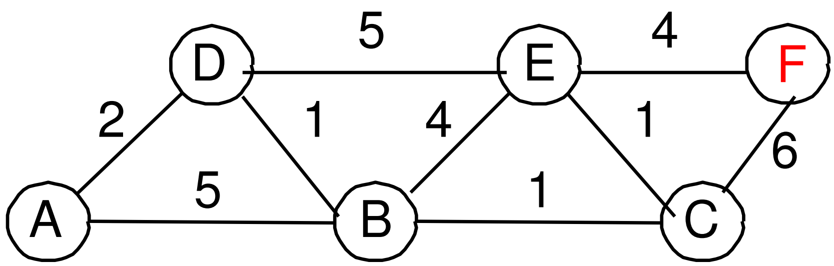
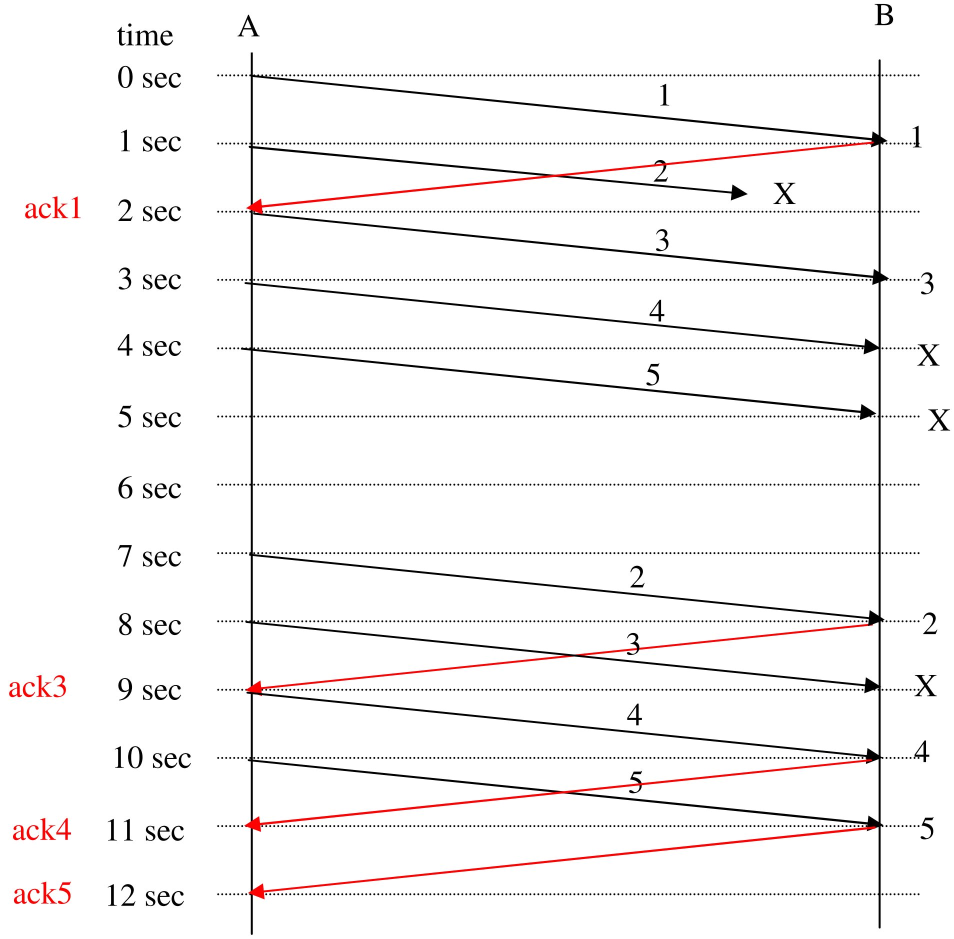


Figure for problem 2.

Problem 3 (20 points). Give the steps for the link state protocol route calculation (Dijkstra's Forward Search algorithm) as it builds the routing database for **node F** in the network shown above

Step	Confirmed	Tentative
1	(F, 0, -)	
2	(F, 0, -)	(E, 4, E) (C, 6, C)
3	(F, 0, -) (E, 4, E)	(C, 5, E) (B, 8, E) (D, 9, E)
4	(F, 0, -) (E, 4, E) (C, 5, E)	(B, 6, E) (D, 9, E)
5	(F, 0, -) (E, 4, E) (C, 5, E) (B, 6, E)	(D, 7, E) (A, 11, E)
6	(F, 0, -) (E, 4, E) (C, 5, E) (B, 6, E) (D, 7, E)	(A, 9, E)
7	(F, 0, -) (E, 4, E) (C, 5, E) (B, 6, E) (D, 7, E) (A, 9, E)	

Problem 4 (20 points). Two host nodes (A and B) are connected via one link and a basic sliding window protocol (no flow control, congestion control or congestion avoidance implemented) is running on both nodes. Consider the sliding window diagram depicted below. A number on the receiver side (B) indicates that the receiver accepted the received packet, while X indicates that the receiver rejected/dropped the received packet.



a) What is the size of the sender window (SWS)?

SWS = 4

b) What is the size of the sender window (RWS)?

RWS = 2

c) What is the timeout set for on the sender side?

timeout = 6 sec

d) Why is the sender not sending any more packets after 10 secs?

Sender is allowed to send more packets but it does not. The only explanation is that it does not have anymore to send (sender buffer empty).

Problem 5 (20 points).

Consider the TCP trace **in Figure 1**.

(a) Identify time intervals representing slow start:

0 - 0.5s; 5.5s – 5.7 s; (also probably at 1.9 – 2.2 s)

(b) Identify time intervals representing linear-increase:

2.2s – 5.5s; 5.7 s – 7s

(c) Identify time intervals representing multiplicative-decrease:

Multiplicative-decrease means that the Congestion Window is cut in half and the connection **continues with this window value**. This does not occur in the graph, so there is *none.*

(d) Explain what is going on from T = 0.5 to T = 1.9.

At 0.5s many packets sent are lost; the connection is not allowed to send any more data. These losses result in a coarse-grained timeout at T=1.9.

(e) The TCP version that generated the trace in Figure 1includes a feature absent from the TCP that generated Figure 2. What is this feature?

fast retransmit;

(f) Both traces lack a feature. What is it?

fast recovery

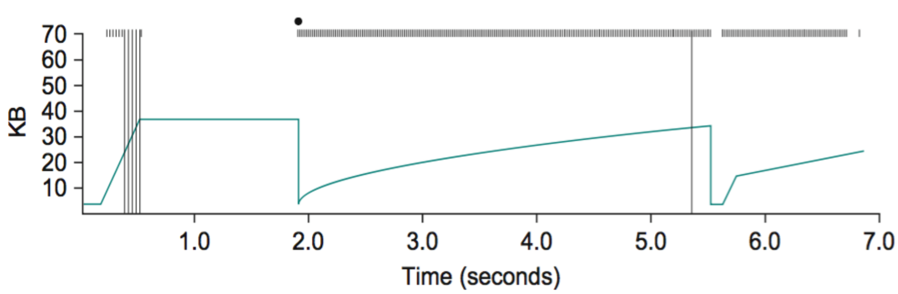


Figure 1

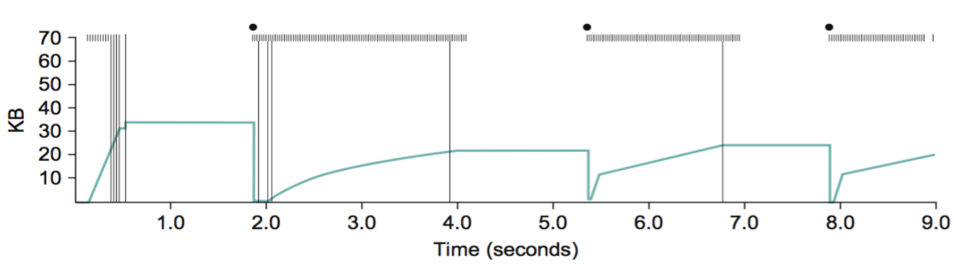


Figure 2