CPE 348 **Exam #2 (50 pts)** **March 25, 2020**

Name ______________________________ **Class: 348**

1) (4 pts) The original algorithm for computing a timeout value for a TCP connection is being used with the parameter $\alpha = .75$. If the current estimated RTT is 50 milliseconds and the sample RTT for the most recent transmission is 40 milliseconds.

a) (2 pts) What is the new estimated RTT?

$$NewRTT = \alpha \times EstRRT + (1-\alpha) \times Samp\ RTT$$

$$= 0.75 \times 50 + 0.25 \times 40$$

$$= \boxed{47.5\ ms}$$

b) (2 pts) What is the timeout time used for this new estimated RTT?

$$Timeout = 2 \times 47.5 = \boxed{95\ ms}$$

2) (8 pts) TCP is operating over a 1.28×10^9 bps link. This link has an RTT of 100 ms.

a) (3 pts) What is the minimum Advertised Window size (in bits) for this network setting?

$$Delay \times BW = 0.1 \times 1.28 \times 10^9 = 1.28 \times 10^8 \text{ bits} = 1.6 \times 10^7 \text{ Byte}$$

$$2^n > 1.6 \times 10^7, \quad n > 23.93, \quad \boxed{n = 24 \text{ bits}}$$

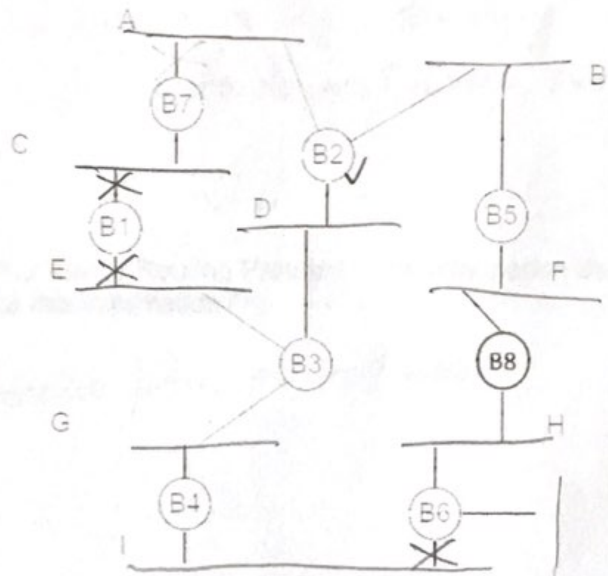
b) (3 pts) If TCP utilizes the full bandwidth (keeping the pipe full), how long will it take for the 32-bit sequence number to wrap around?

$$\frac{2^{32} \times 8}{1.28 \times 10^9} = \boxed{26.84\ s}$$

c) (2 pts) If each sequence number is modified to represent 4 bytes of data instead of 1 byte, how long will it take for the 32-bit sequence number to wrap around?

$$\frac{2^{32} \times 4 \times 8}{1.28 \times 10^9} = \boxed{107.36\ s}$$

3) (6 pts) Given the extended LANs connected by 8 bridges shown below, indicate the trimmed network by the spanning tree algorithm to avoid possible loops. Suppose **B2** is elected as the root. (You may just mark them on the graph.)



4) **(18 pts)** Answer the following short answer questions.

a) (3 pts) What makes the correct estimation of RTT in TCP difficult or even impossible?

distance is long. too many
intermediate devices (routers. switches)
congestion happens anywhere that causes
packets to drop.

c) (2 pts) For the Distance Vector Routing Protocol, what information does a node exchange and which nodes receive this information?

cost/distance infor. to its neighbours.

d) (2 pts) For the Link State Routing Protocol, what information does a node exchange and which nodes receive this information?

cost/distance infor. to all other nodes.

e) (3 pts) How to address the triangle routing problem in the mobile IP?

share care-of-address

f) (4 pts) Alice decides to start a small company. She asks her ISP, GoChargers, to give her enough addresses for 1000 hosts. GoChargers has the following available address range for Alice.

192.1.0.*
192.1.1.*
192.1.2.*
192.1.3.*
192.1.4.*

$\underline{4 \times 256} > 1000$

In order to save money, what should Alice claim under CIDR to get fewest number of address possible to cover her hosts? (please use address & prefix format, e.g., 128.2/16) (3pts)

And how many unused IP address will be incurred under this kind of purchase? (1pts)

192.1.0.0 — 192.1.3.231

0000,0000 0000 0011

$\boxed{192.1.0/22}$ $2^{10} - 1000 = \boxed{24}$

g) (4 pts) A router has the following (CIDR) entries in its routing table:

Address mask	Next hop
135.46.56.0/22	Interface 0
135.46.60.0/22	Interface 1
192.53.40.0/23	Router 1
default	Router 2

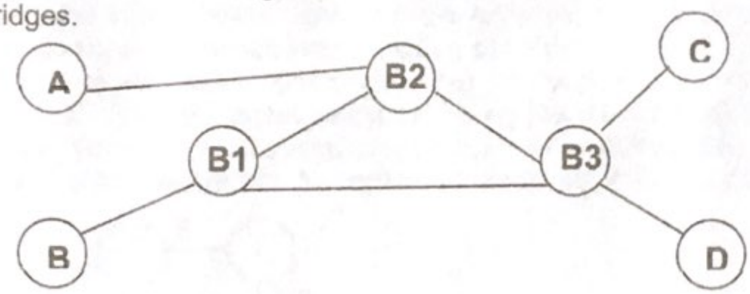
56
00111000
00111100
60

40
00101000

For each of the following addresses, what will the router do if a packet with that address arrives?

i. 135.46.52.2 → 00110100 → No Match → $\boxed{\text{Router 2}}$
ii. 192.53.56.7 → 00111000 → No Match → $\boxed{\text{Router 2}}$

6) (6 pts) Consider the following network where A, B, C and D are nodes and B1, B2 and B3 are learning bridges.



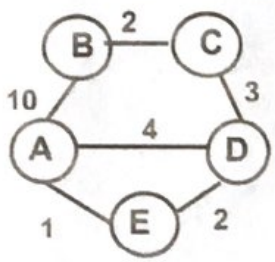
Assume that the forwarding tables for the three bridges are all empty when the three **transmissions below are made in the order shown**. When the transmissions have been made in the following consecutive order, identify if terminal A, B, C, D can overhear the ongoing transmission on its network interface.

Transmission: 1) D transmits to B 2) C transmits to D 3) A transmits to C

If a node can receive that packet for that transmission, please put **Y**; otherwise, put **N**. For the respective initiator (i.e., sender) of each transmission, **N/A** is already placed in the table.

Transmission 1)		Transmission 2)		Transmission 3)	
Node	Hear Transmission?	Node	Hear Transmission?	Node	Hear Transmission?
A	Y	A	N	A	N/A
B	Y	B	N	B	Y
C	Y	C	N/A	C	Y
D	N/A	D	Y	D	N

7) (8 pts) Distance Vector: The Distance Vector Routing Algorithm is to be performed starting with the initial table shown below. Entries in the table are in the **form of cost/next hop.** So the initial table indicates which nodes are neighbors of a particular node (i.e. neighbors that will provide updated information to a particular node). In this problem, node A receives vectors from nodes B, D and E. Fill in the tables below for the results after one exchange of vectors and after two exchanges. Give entries in the table in the **form of cost/next hop** as shown in the initial table. For each of the distance vector tables, complete the known routing table for node B.



Info at Node	Distance to reach node – initial table				
	A	B	C	D	E
A	---	10/B	∞	4/D	1/E
B	10/A	---	2/C	∞	∞
C	∞	2/B	---	3/D	∞
D	4/A	∞	3/C	---	2/E
E	1/A	∞	∞	2/D	---

Node B Routing Table		
Destination	Cost	NextHop
~~B~~ A	10	A
C	2	C
D		
E		

Info at Node	Distance to reach node – after 1 exchange				
	A	B	C	D	E
A	---	10/B	7/D	3/E	1/E
B	10/A	---	2/C	5/C	11/A
C	7/D	2/B	---	3/D	5/D
D	3/E	5/C	3/C	---	2/E
E	1/A	11/A	5/D	2/D	---

Node B Routing Table		
Destination	Cost	NextHop
~~B~~ A	10	A
C	2	C
D	5	C
E	11	A

Info at Node	Distance to reach node – after 2 exchanges				
	A	B	C	D	E
A	---	9/D	6/E	3/E	1/E
B	9/C	---	2/C	5/C	7/C
C	6/D	2/B	---	3/D	5/D
D	3/E	5/C	3/C	---	2/E
E	1/A	7/D	5/D	2/D	---

Node B Routing Table		
Destination	Cost	NextHop
~~B~~ A	9	C
C	2	C
D	5	C
E	7	C