92

Notre Dame University

CSC 435 Operating System & Networks

Exam2

Fall 2008

Duration: 1 Hour

Name: [redacted]

ID: [redacted]

Instructions

1. Write your answers in the space provided on the question sheet.
2. Use the back pages for rough work.
3. There are 20 Multiple choice and True/False questions worth a total of 20 pts.
4. There are 3 subjective problems worth a total of 87 pts.
5. Pages 6 and 8 are left intentionally blank.
6. **There is NO correlation between the space provided for each problem and the space needed. If you need more space write on the back and clearly indicate that you did so.**

16

Multiple choice/True and False
Each question in this section is worth 1pt.

1. A port number is used to distinguish different processes on the same computer

   (a) True
   (b) False

2. TCP is a connection oriented protocol

   (a) True
   (b) False

3. UDP is a connection oriented protocol

   (a) True
   (b) False

4. TCP provides reliable delivery

   (a) True
   (b) False

5. UDP provides reliable delivery

   (a) True
   (b) False

6. Every TCP connection has to have at least one segment with the one bit field A in the header is set to one

   (a) True
   (b) False

7. Every TCP connection has to have at least one segment with the one bit field P in the header is set to one

   (a) True
   (b) False

8. Every TCP connection has to have at least one segment with the one bit field R in the header is set to one

   (a) True
   (b) False

9. During a TCP connection the number of segments with FIN=1 is

   (a) 1
   (b) 2
   (c) 3
   (d) 4
   (e) 5

10. During a TCP connection the number of segments with SYN=1 is

   (a) 1
   (b) 2
   (c) 3
   (d) 4
   (e) 5

11. The receive window in the TCP header is used for

   (a) Congestion control
   (b) Flow control
   (c) Error control
   (d) Connection control
   (e) None of the above

12. HTTP is a stateless protocol

   (a) True
   (b) False

13. The DNS database is centralized

   (a) True
   (b) False

14. The keyword **list** is used in

   (a) Authentication phase of POP3
   (b) Authentication phase of SMTP
   (c) Transaction phase of POP3
   (d) Transaction phase of SMTP

15. DNS records have three fields: name, value and type. If the type of a DNS record is A then

(a) The name is a host name and value is an IP address.
(b) The name is a domain and value is a host name.
(c) The name is an alias and value is the canonical name.
(d) The name is a domain and the value is a mail server.

16. IF the type of a DNS record is MX then
(a) The name is a host name and value is an IP address.
(b) The name is a domain and value is a host name.
(c) The name is an alias and value is the canonical name.
(d) The name is a domain and the value is a mail server.

17. DNS records have three fields: name, value and type. If the type of a DNS record is NS then
(a) The name is a domain and the value is the name of the DNS server for the domain.
(b) The name is a server name and the value is the IP of the server.
(c) The name is an alias and the value is the real name.
(d) The name is a domain and the value is the mail server for the domain.

18. The key word **POST** is used in
(a) HTTP
(b) POP3
(c) SMTP
(d) DNS

19. When an HTTP client has already a cached copy of a URL it uses the following command to check if it has an up to date copy
(a) GET
(b) POST
(c) HOST
(d) Conditional Get

20. In POP3 protocol the user is authenticated during the transaction phase
(a) True
(b) False

36

RTT = 4 ms

T = 8 ms

Problems

1. (36pts)A sender having window size 4 transmits at 1 million bits per second. The packet size is 1000 bits and the round trip time between sender and receiver is 4 ms. The sender starts a timer for a packet when it **finishes** transmitting it and uses a timeout period of 8 ms. The receiver sends an acknowledgement immediately after it receives the last bit of a packet. Assume that the transmission of acknowledgements takes 0ms, the sender needs to send a total of 8000 bits and the first bit is transmitted at t=0. The protocol in use is GBN.

   (a) How many bits are sent before the sender receives the first acknowledgement.

   (b) At what time the last bit arrives at the receiver if no packet is lost.

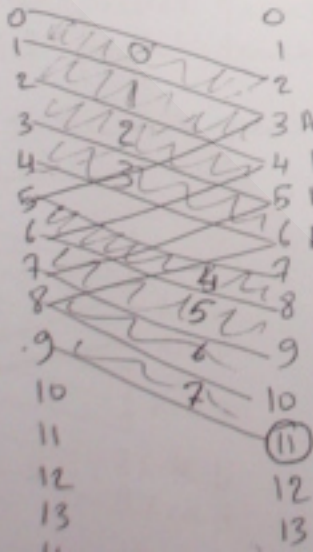
   (c) At what time the last bit arrives at the receiver if only one loss occurs (packet numbering starts at 0), the first transmission of packet number 2.

   (d) What is the total number of transmitted packets in 1b and 1c.

   (e) redo 1b, 1c and 1d in the case of sender and receiver using a selective repeat protocol.

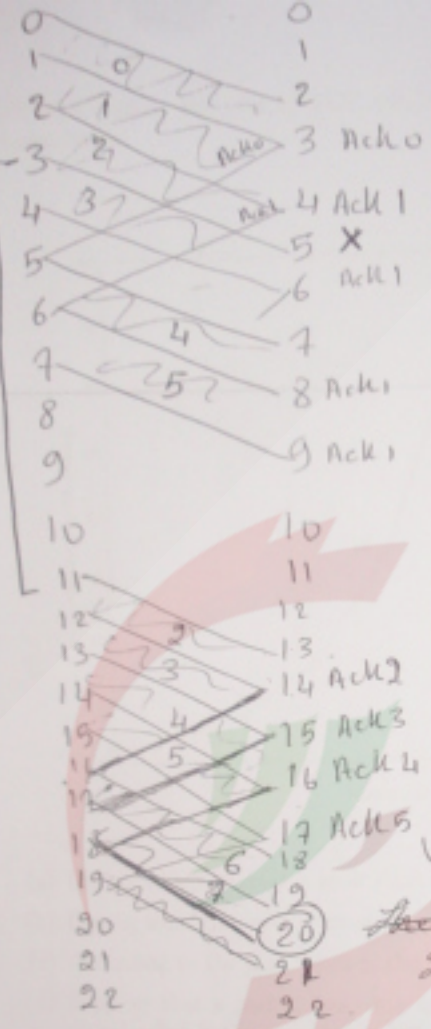
a) as window size is 4 and the packet size is 1000 bits so the sender send (4 × 1000 = 4000 bits) before receiving the first ACK.

b) $\frac{1 \text{ million b/s}}{1000} = 1$ ms (each packet needs one ms to be totaly transmitted)



the last bit arrives at (11 ms)

c)



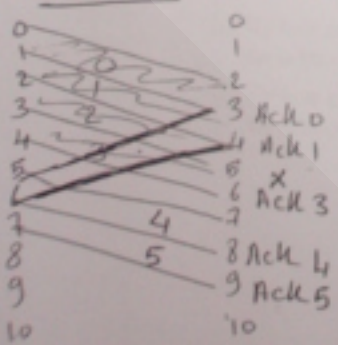
Timeout
= 3+8 = 11 ✓

~~the~~ the last bit will arrive at 20 ms

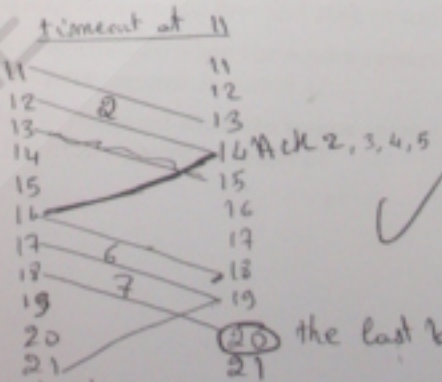
d) total packet transmitted at b) is 8
total packet transmitted at c) is 8 + 4 = 12.

e) in selective repeat b) won't change

About c)



timeout at 11

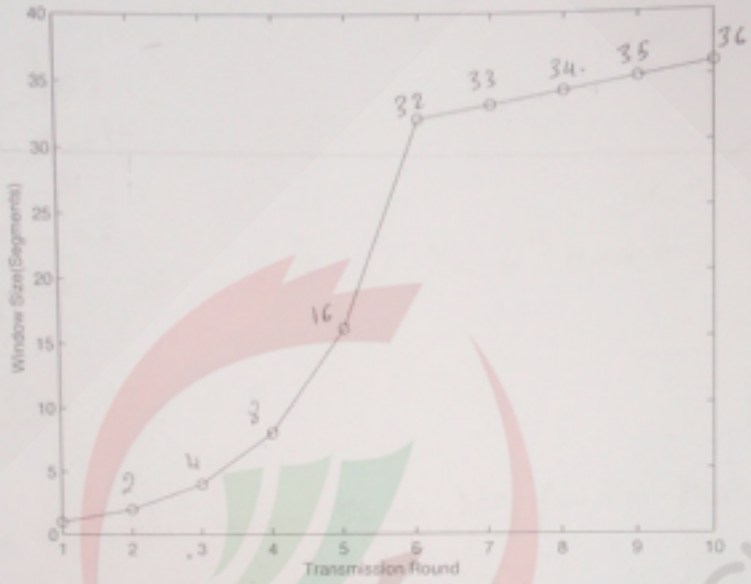


the last bit will arrive 20ms ✓

Abt d) Total packet transmitted at b) = 8
8 + 1 = 9

2. (36pts) Consider the plot of TCP window size as a function of time shown below.

30



(a) During which interval is slow start operating. [0, 6]

(b) During which interval is congestion avoidance is operating. [6, 10]

(c) According to the plot, what is the threshold? 32

(d) Suppose that a packet loss, due to a timeout, occurs at the 10 round, what is the new threshold? new threshold $= \frac{\text{segment 10}}{2} = \frac{36}{2} = 18$

(e) What is the window size at the 11 th round? 1

(f) Can a packet loss be detected before a timeout occurs? if so what is the new threshold and the new congestion window? → on next page

(g) During which round is segment 35 sent? → on next page

(h) What is the average throughout between the first and 10th round?

(i) By how much is the window incremented when the sender receives an acknowledgement for the **first** segment in round 4?

(j) By how much is the window incremented when the sender receives an acknowledgement for the **first** segment in round 6?

} → next page.

f) yes, it can be detected by triple Acks
so the new threshold = $\frac{36}{2} = 18$.
the new cogestion window = new threshold = 18 ✓

g) 1) 1
2) 2 - 3
3) 4 - ~~7~~ 7
4) ~~8~~ 8 - 15
5) 16 -- 31
6) 32 -- 63
So segment 35 is sent at the 6th round ✓

h) $\frac{1+36}{2} = \frac{37}{2} = 18.5$

i) when the sender receive ~~the~~ an ACK for the first segment in round 4, its window size increase by 8. X

j) when the sender receive an ACK for the first segment Round 6, its window size increment by 1 ✓

f) yes, it can be detected by triple Acks
so the new threshold = $\frac{36}{2} = 18$.
the new congestion window = new threshold = 18

g) 1) 1
2) 2 - 3
3) 4 - ~~15~~ 7
4) ~~16~~ 8 - 15
5) 16 -- 31
6) 32 -- 63
So segment 35 is sent at the 6th round

h) $\frac{1+36}{2} = \frac{37}{2} = 18.5$

i) when the sender receive ~~the~~ an ACK for the first segment in round 4, its window size increase by 8. X

d) when the sender receive an ACK for the first segment in Round 6, its window size increment by K

f) yes, it can be detected by triple Acks
So the new threshold = $\frac{36}{2} = 18$.
the new congestion window = new threshold = 18 ✓

g) 1) 1
2) 2 - 3
3) 4 - 7
4) 8 - 16
5) 16 - 31
6) 32 - 63
So segment 35 is sent at the 6th round ✓

h) $\frac{1+36}{2} = \frac{37}{2} = 18.5$

i) when the sender receive an ACK for the first segment
ound 1, its window size increase by 8 ✗

d) when the sender receive an ACK for the first segme
und 6, its window size increment by K

3. (15pts)Host X and Y are exchanging data using a TCP connection. Both hosts use a timeout period of 2 seconds. At t=0 host X sends two back-to-back segments, of size 50 and 30 bytes, to Y with the TCP header of the first segment having the following values: sequence number=42, receive window=70, A-bit =1, Acknowledgement number=123, source port=567, destination port=80. Suppose that Y sends it own data to X only when it receives data from X (i.e. sends data and ack in the same segment).

(a) Y needs to send 87 bytes. How many segments does Y use to send the 87 bytes. Explain.

(b) What are the header values in those segments?

(c) Suppose that the last segment in 3a arrives at X at t=1.8 s and that the **first** in 3a never reached X. How many segments are **retransmitted** by X? Explain.

a) as the receiving window of X = 70 and Y needs to send 87 bytes so, it will send them in 2 segments : the first 70 bits
the second 17 bits.

b) in the first segment

	second segment
sequence number = (123+30) = 153	154
receive window = 50	50
A-bit = 1	1
Acknowledgement number = (153+70) = 223	(154+17) = 171
source port = 80	80
destination port = 567	567

c) X will retransmit the first segment as the second segment arrives before the time out.

As X send 2 back-to-back segments, so it will retransmit both (as the first doesn't arrive).