Department of Computer Science and Information Systems, BITS Pilani
Second Semester 2017-2018 Computer Networks (CS F303) **A**
QUIZ-1 (CLOSE BOOK)

Duration: 45 Mints [12:00 to 12:45 PM] **Date: 28-2-2018** **MM: 20**

NAME: **SAMPLE SOLUTION** **ID:** **SAMPLE SOLUTION**

Instructions: Write your answers in the space provided.

Q.1 Write the **Action** taken by the pipelining protocols (i.e., GBN, SR and TCP) corresponding to each of the **Event** mentioned. [0.5 M for each correct action] [3]

Event: An out of order packet higher than expected sequence number arrived at receiver	
Action for GBN: Discard the packet and send ACK for last in order packet received	Action for SR: Buffer it and send the acknowledgement for the received packet
Action for TCP: Buffer it and send the ack indicating sequence number of next expected byte (duplicate ACK)	
Event: An out of order acknowledgement (acknowledging a packet within current window) is received by sender	
Action for GBN: Update window and start timer for most outstanding packet (if any)	Action for SR: Mark that packet as received and stop timer for the received packet
Action for TCP: Update sending base. (In TCP ack with no. x+1 implies that all bytes up-to x are received at receiver.) Start timer for most outstanding packet for that ACK is not received (if any)	

Q.2 How many RTTs will be required to access a web page having five small objects (object transmission time is negligible) for the following? Assume that http GET request is piggybacked in ACK of SYN-ACK packet during TCP connection establishment process. You can assume all objects are on same web server. Ignore RTTs required for DNS query in your calculation. [0.5 x 4 = 2M]

Note: In all cases, first 2 RTTs for TCP connection establishment and to receive base html page from server.

Non-persistent HTTP with no parallel TCP connections 2 + 2 x 5 (per object 2 RTTs including connection establishment) = 12 RTT	Non-persistent HTTP with 5 parallel TCP connections 2 + 2 (all objects are transferred in parallel in 2 RTTs) = 4 RTT
Persistent HTTP with pipelining 2 + 1 (all objects are transferred in one RTT) = 3 RTT	Persistent HTTP without pipelining 2 + 5 (one object transferred per RTT) = 7 RTT

Q.3 Suppose that you have created a new web site with domain name allizwell.edu. Which DNS resource records need to be entered into the TLD edu server corresponding to your primary authoritative DNS server? Show the required resource records in the format as **(Name, Value, Type)**. Assume that the name of your primary authoritative DNS server is globe.allizwell.edu and its IP address is 210.100.100.10. Consider your webserver IP address is 210.100.100.4 [1+1]
(allizwell.com, globe.allizwell.com, NS) (globe.allizwell.com, 210.100.100.10, A)

Q.4 Consider distributing a file of 15 Gbits to 100 peers. The server has an upload rate of 30 Mbps, and each peer has download rate of 2 Mbps and upload rate of 300 Kbps. Calculate the minimum distribution time required for client-server and Peer-to-Peer architectures? Show key steps of calculation. [1.5 M for each] [3]

For Client Server the minimum time is: 50,000 sec. (NF/U_s)

For P2P the minimum time is: 25,000 sec. ($NF/(U_s + \Sigma U_i)$)

Q.5 Suppose Host A sends two TCP segments back to back to Host B over a TCP connection. The first segment has sequence number 56; the second has sequence number 92. [1+1]

a) How much data is sent in the first segment?

92 – 56 = 36 Bytes

b) Suppose that the first segment is lost but second segment arrives at B. In the acknowledgement that Host B sends to Host A, what will be the acknowledgement number?

56

Q. 6 a) What is the purpose of the connection-oriented welcoming socket, which the server uses to perform an *accept()*? Once the *accept()* is done, does the server use the welcoming socket to communicate back to the client?

A connection oriented server waits on the welcoming socket for an incoming connection request. When that connection request arrives a new socket is created at the server for communication back to that client.

b) Suppose a web server has 1000 ongoing TCP connections. How many server-side sockets are used? [1+1]

There will 1001 sockets in use – the single welcoming socket and the 1000 sockets in use for server-to-client communication.

Q.7 a) A packet loss event occurred at TCP Reno sender when its window size is 64 Kbytes. This packet loss event is detected by Timeout. Assume MSS value as 2 Kbytes.

a) What will be the new slow start threshold (ssthresh) (in Kbytes) of TCP?

32

b) What will be the new sender window size (in Kbytes) of TCP?

2

c) After Timeout, how many RTTs will it take to reach the TCP sender window size at 40 Kbytes? [1+1+1]

Sender window is reduced to 1 MSS in the next RTT after timeout occurs then window size grow as follows (in MSS): 1, 2, 4, 8, 16, 17, 18, 19, 20 (9 RTTs)

Q.8 Hosts A and B are connected to a switch S via 10 Mbps links as shown in the Fig. below. The propagation delay on each link is 20 µs. Switch S is a store and forward device; it begins transmission of received packet 35 µs after it has finished receiving it. Show key steps of calculation for both parts. [1+2]

a) How long does it take to send 20,000 bits from host A to B, assuming these bits are sent in a single packet of 20,000 bits?

Transmission time for 10 bps link = $20000/(10 \times 10^6) = 2000$ µs

Time required to arrive packet at B = 2000 + 20 + 35 + 2000 + 20 = 4075 µs

b) How long does it take to send 20,000 bits from host A to B, assuming these bits are broken up into 5 packets with each packet containing 4000 bits and packets are sent one after the other continuously?

Time required to arrive first packet at B = $4000/(10 \times 10^6)$ = 400 + 20 + 20 + 35 +400 = 875 µs

Time required to arrive last packet at B = 400 x 6 + 75 = 2475 µs

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