COMP3234B Computer and Communication networks

Assignment 2 (8%)

Sample Solution

Total mark is 100.

1. (20 marks) [Store-and-Forward in Packet-Switched Networks (ILO3)]

Answer:

(1) Time taken to send entire file from source host to router 1: 15X8/0.6+0.002 = 200.002 (s) **(1 marks)**

Time taken to send entire file from router 1 to router 2: 15X8/1.5+0.004 = 80.004 (s) **(1 marks)**

Time taken to send entire file from router 2 to destination host: 15X8/1.2+0.003 = 100.003 (s) **(1 marks)**

Total time: 380.009 seconds **(2 marks)**

(2) Time taken to send one packet from source host to router 1: 15X8/(10X0.6)+0.002 = 20.002 (s) **(1 marks)**

Time taken to send one packet from router 1 to router 2: 15X8/(10X1.5)+0.004 = 8.004 (s) **(1 marks)**

Time taken to send one packet from router 2 to destination host: 15X8/(10X1.2)+0.003 = 10.003 (s) **(1 marks)**

Time taken for an ACK to be delivered from the destination to source: 0.009 s **(1 marks)**

Total time taken to finish transmission of one packet from source to destination: 20.002 +8.004 +10.003 +0.009 = 38.018 seconds **(2 marks)**

Total time taken to send entire file from source to destination: 38.018 X 10 = 380.18 seconds **(2 marks)**

(3) Time at which 1st packet is received at the destination host = 20.002 +8.004 +10.003 = 38.009 seconds **(2 marks)**

After this, every 20.002 seconds one packet will be received **(3 marks)**

Thus time at which the last packet is received = 38.009 + 9 X 20.002 = 218.027 seconds **(2 marks)**

2. (10 marks) [DNS, Web Application (ILO2, 3)]

Answer:

(1) (8 **marks**)

The steps and time involved are:

(i) the client sends a request to local DNS server: 2 **(1 marks)**

(ii) the local DNS server queries the root DNS server, which responds with IP address of the TLD DNS server: 9+9 **(1 mark)**

(iii) the local DNS server queries the TLD DNS server, which responds with IP address of the authoritative DNS server: 7+7 **(1 mark)**

(iv) the local DNS server queries the authoritative DNS server, which responds with IP address of the web server: 4+4 **(1 mark)**

(v) the local DNS server sends IP address of the web server to the client: 2 **(1 marks)**

(vi) the client sends the HTTP request for the webpage to the web server: 6 **(1 mark)**

(vii) the web server sends the webpage to the client: 6 **(1 mark)**

Total time: 56 **(1 mark)**

(2) (2 **marks**) The steps and time involved are:

(i) the client sends the HTTP request for the image to the web server: 6 **(0.5 mark)**

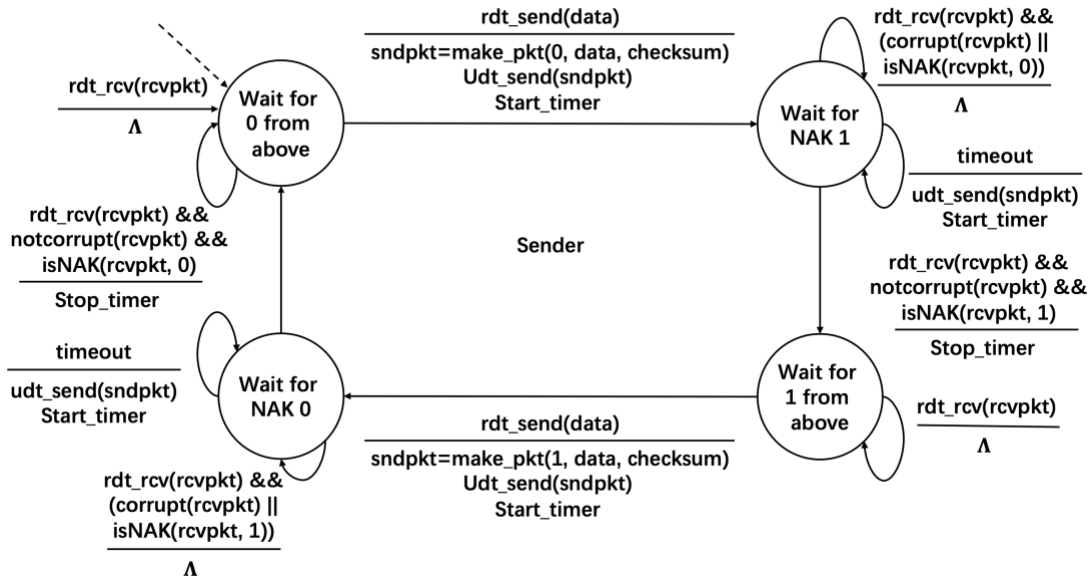
(ii) the web server sends the image to the client: 6 **(0.5 mark)**

Total time: 12 **(1 mark)**

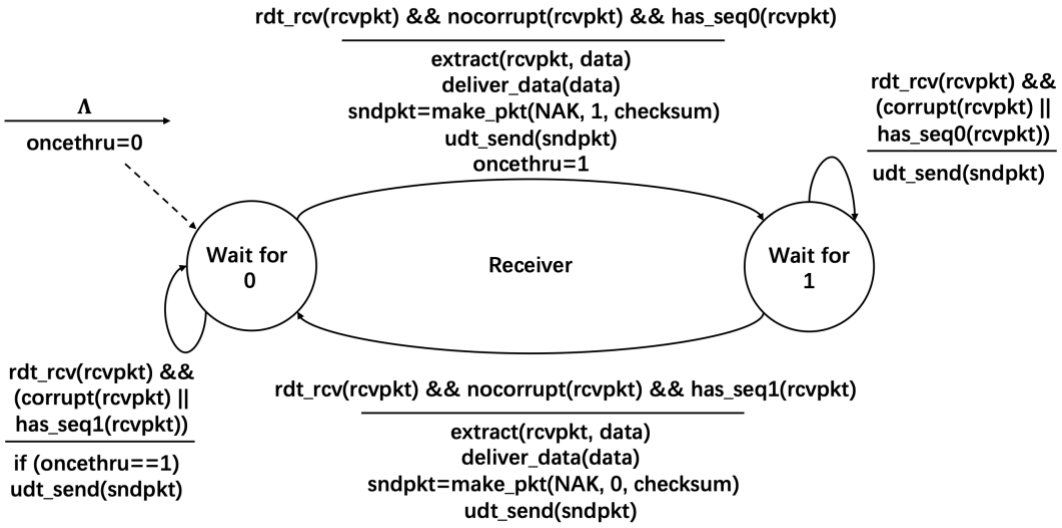
3. (15 marks) [Stop-and-Wait (ILO2, 3)]

Answer: (deduct 0.5 marks per wrong entry)

Sender FSM:

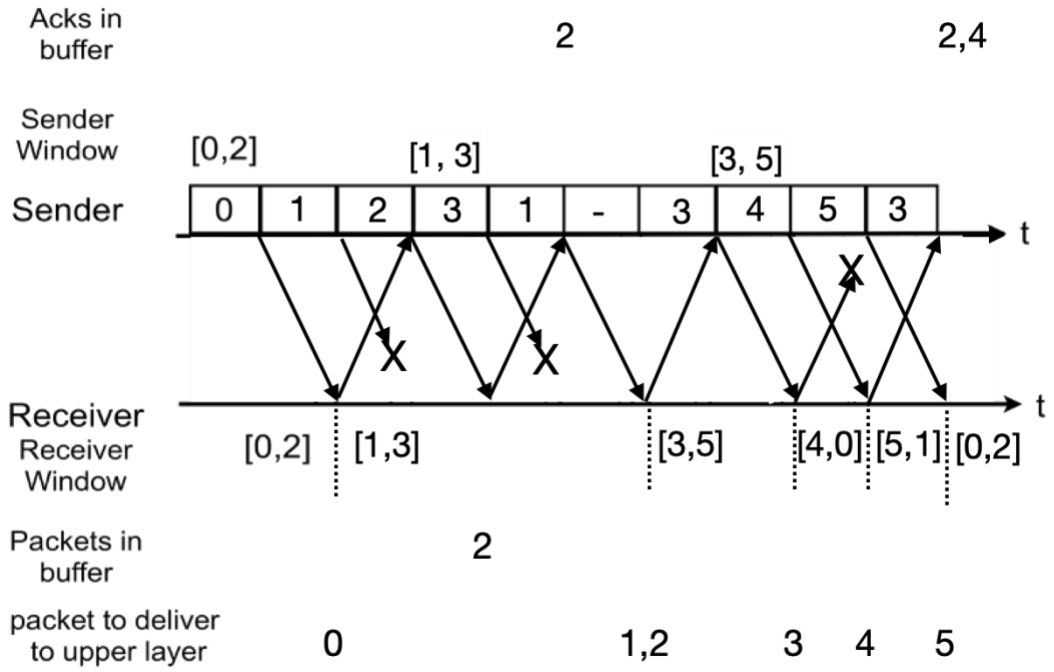


Receiver FSM:



4. (15 marks) [Selective Repeat RDT (ILO3)]

Answer: 0.625 **marks per entry**

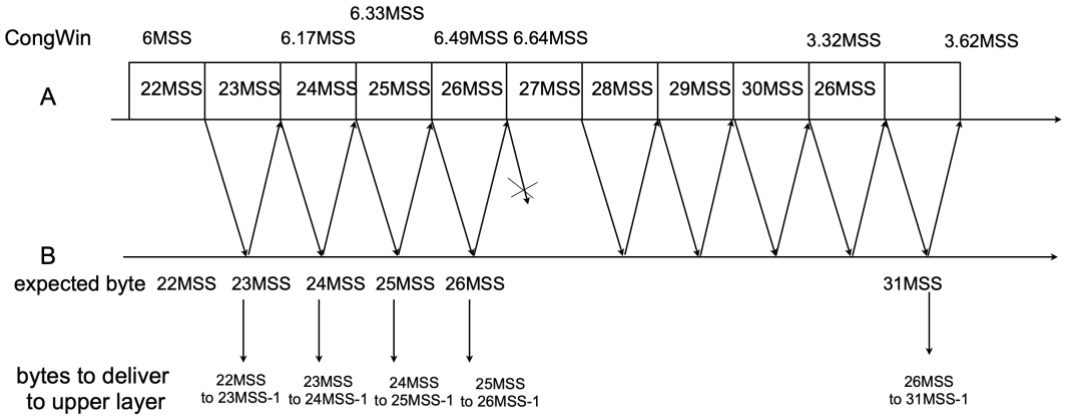


5. (18 marks) [TCP RDT and Congestion Control (ILO2, 3)]

Answer:

(1) (6 marks)
The new CongWin=37/6 MSS
The new largest sender window: [26MSS **(3 marks)**, 32(1/6)MSS-1 **(3marks)**]

(2) (12 marks) **(0.5 marks per missing/wrong entry)**



6. (22 marks) [TCP Congestion Control and RTT (Learning Outcomes 2, 3)]

Answer:

(1) (16 marks)

(10 marks for the table: deduct 0.2 marks per wrong entry in the table)

Time (in RTTs)	CongWin of TCP connection 1 (in MSS)	ssthresh of TCP connection 1 (in MSS)	CongWin of TCP connection 2 (in MSS)	ssthresh of TCP connection 2 (in MSS)
1	1	16	1	16
2	2	16	2	16
3	4	16	4	16
4	8	16	8	16
5	16	16	16	16
6	17	16	17	16
7	18	16	18	16
8	19	16	19	16
9	1	8	1	8
10	2	8	2	8
11	4	8	4	8
12	8	8	8	8
13			9	8
14			10	8
15			11	8
16			12	8

A loss occurs in RTT 19 in each TCP connection, and the missing segment will be retransmitted

in the next RTT.
Since 49.5Kbytes/500bytes=99=1+2+4+8+16+17+18+18+1+2+4+8, host A's file transfer takes 12RTTs. **(3 marks)**
Since 70.5Kbytes/500bytes=141=1+2+4+8+16+17+18+18+1+2+4+8+9+10+11+12, host B's file transfer take 16RTTs. **(3 marks)**

(2) (6 marks)
Throughput on TCP connection 1:
49.5Kbytes/(12RTTs)=49.5/(12*0.2)KB/s=20.6KB/s=165Kbps **(3 marks)**

Throughput on TCP connection 2:
70.5Kbytes/(16RTTs)=70.5/(16*0.2)KB/s=22.0KB/s=176.25Kbps **(3 marks)**