Assignment # 2 (For BS-CS: All Sections)
(CS-3001 Computer Networks – Fall-2024)

Due Date and Time: Sunday, 20th October, 2024 (10:00 pm) Marks: 50

Instructions:

- *Late assignment will not be accepted*
- *Only handwritten attempt will be graded, i.e., printed attempts will not be graded*
- *There will be no credit if the given requirements are changed*
- *Your solution will be evaluated in comparison with the best solution*
- *Whenever a calculation is involved, your solution should show complete steps and a final answer. There will be significant marks for the correct final answer (as far as assignments are concerned).*
- *You must write your roll number, name, and section (Computer Networks Course section) on your submitted attempt.*
- *Submit scan copy of your written assignment on GCR before deadline.*

For the problems below, consider your roll number.

Problem 1: [10 Marks]

Solve P22 of Chapter 2 of the textbook after doing the following modification:
In the problem, the upload rate of the server is 30 Mbps. You should not consider this value and instead you should consider the upload rate equal to:

22 + (your roll number modulus 15) Mbps.
For example, if your roll number is 22i-0125, then the upload rate is 22 + (125 modulus 15) = 27 Mbps.

Problem 2: [10 Marks]

What is the Apache Web server? How much does it cost? What functionality does it currently have? What are other types of commonly used servers writing short description and functionality of each? You may want to look at chatgpt /wikipedia to answer this question.

Problem 3: [10 Marks]

Solve P31 of Chapter 3 of the textbook after doing the following modification:
In the problem, alpha = 0.125 and beta = 0.25. You should not consider these values and instead you should consider the following values:

alpha = (100 + (your Student ID modulus 32)) / 1000
beta = (200 + (your Student ID modulus 45)) / 1000
For example, if your Student ID is 22i-0125, then alpha is (100 + (125 modulus 32)) / 1000 = 0.129
and
beta = (200 + (125 modulus 45)) / 1000 = 0.235

Problem 4: [10 Marks]

Host A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 126. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 80 and 40 bytes of data, respectively. In the first segment, the sequence number is 127, the source port number is 302, and the destination port number is 80. Host B sends an acknowledgment whenever it receives a segment from Host A.

a. In the second segment sent from Host A to B, what are the sequence number, source port number, and destination port number?

b. If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number, the source port number, and the destination port number?

c. If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number?

d. Suppose the two segments sent by A arrive in order at B. The first acknowledgment is lost and the second acknowledgment arrives after the first timeout interval. Draw a timing diagram, showing these segments and all other segments and acknowledgments sent. (Assume there is no additional packet loss.) For each segment in your figure, provide the sequence number and the number of bytes of data; for each acknowledgment that you add, provide the acknowledgment number.

Problem 5: [10 Marks]

Consider a channel that can lose packets but has a maximum delay that is known. Modify protocol rdt2.1 to include sender timeout and retransmit. Informally argue why your protocol can communicate correctly over this channel.

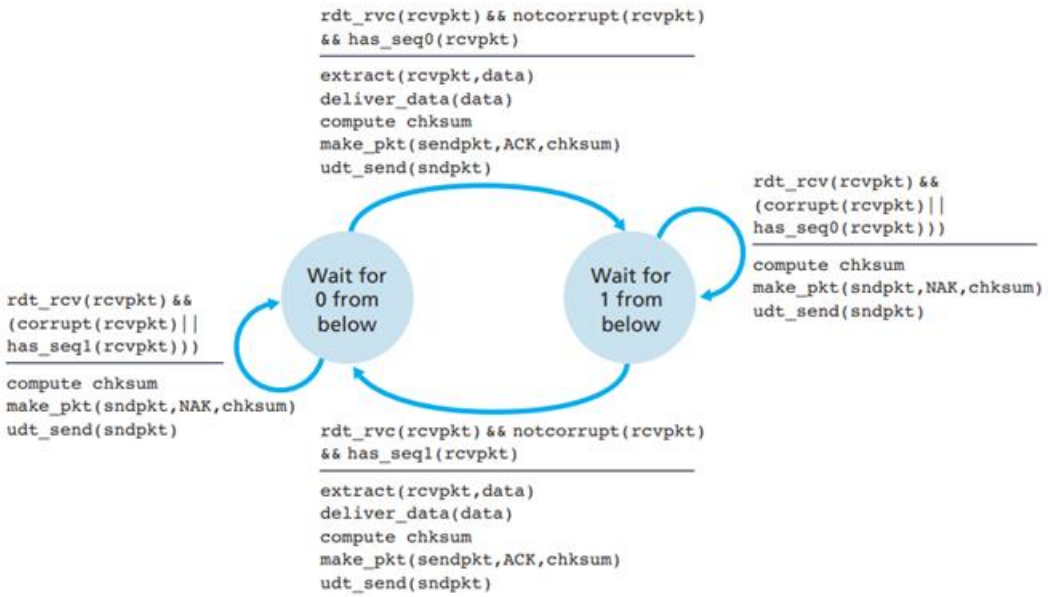

Figure ♦ An incorrect receiver for protocol `rdt 2.1`