Indian Institute of Technology Kharagpur

Department of Computer Science and Engineering

Class Test-3, Spring 2020-21

Computer Networks (CS31006)

Students: 155 **Date**: 13-March-2021

Full marks: 30 **Time**: 60 minutes

Credit: 20%

INSTRUCTIONS: This is an OPEN-BOOK, OPEN-NOTES test. Please write your answers in a text file/.doc file, convert it to PDF, and submit this PDF file containing ONLY YOUR ANSWERS on Moodle. PLEASE DO NOT SUBMIT SCANNED HAND-WRITTEN ANSWERS, SUCH ANSWER-SCRIPTS WILL NOT BE GRADED. DO NOT FORGET TO WRITE YOUR NAME AND ROLL NUMBER AT THE TOP OF YOUR ANSWER SHEET. ANY DETECTED CASE OF PLAGIARISM WILL BE DEALT WITH STRICTLY, WITH ALL THE IMPLICATED STUDENTS RECEIVING ZERO IN THIS TEST. You may use calculators if required. This question paper contains two pages. ANSWER ALL QUESTIONS.

1. Does TCP use *Selective Repeat* (SR) or a *Go-Back-N* (GBN) for flow control? Explain your answer. **[2 + 2 = 4]**

2. Explain the "SYN Flood" attack on TCP connections. Also, suggest one method of resisting the attack. **[2 + 2 = 4]**

3. Assume that you have set up a TCP connection over a lossless link with end-to-end bandwidth 2 Gbps. Further assume that you are using 16-bit sequence numbers for individual bytes. If the end-to-end link delay is 50 milliseconds, is it safe to use this 16-bit sequence number field for a sliding window based flow control algorithm? [Hint: By "safe", we mean the ability of the protocol to distinguish between different segments. Further, note that we can use a simple sliding window protocol and not an ARQ protocol, as the link is lossless.] **[3]**

4. Explain the *Silly Window Syndrome* of TCP, and *Clark's Solution* to solve it. **[2 + 2 = 4]**

5. Consider a TCP connection, which calculates the TCP *Retransmission Timeout* SRTT, RTTVAR and RTO parameters following the standard *Jacobson's Algorithm*, with parameters α and β determined as follows. The parameter α can be calculated from your roll number, by adding all the letters and digits, calculating the remainder modulo-5, dividing by 10, and adding to $\frac{1}{2}$. The letters are assumed to have the following numerical values: A=1, B=2, $\cdots$ Z=26. For example, if your roll number is 15YZ12345, then $\alpha = \frac{(1+5+25+26+1+2+3+4+5) \pmod 5}{10} + \frac{1}{2} = \frac{2}{10} + \frac{1}{2} = \frac{7}{10}$. The parameter β is set to be $\beta = \frac{\alpha}{2}$. Assume the following initial values: $SRTT_{\text{initital}} = 0$ ms and $RTTVAR_{\text{initial}} = 0$ ms. Given that the first two measured values of the round-trip time are 1100 milliseconds and 1500 milliseconds respectively, and your roll number, calculate the value of the *RTO* parameter after the acknowledgement for the second TCP segment has been received. **[5]**

6. State whether each of the following statements is True or False, with a brief (1-2 sentence(s)) explanation in support of your answer:

   (a) Ordinary implementations of TCP uses *Selective Acknowledgement* (SACK) to request for missing segments. **[2]**

   (b) The *Maximum Segment Size* (MSS) for a TCP connection is often set to about 1500 bytes in practice. **[2]**

   (c) During the *Slow Start* phase, the *CWnd* parameter in *TCP Tahoe* increases at an extremely slow rate. **[2]**

(d) *Delayed Acknowledgement* combined with *Nagle's Algorithm* can result in starvation in a TCP connection. **[2]**

(e) The "URG" flag has lower priority than the "PSH" flag in TCP. **[2]**