Your name:

Quiz 1
CS/EE 555
Fall 2001
September 21, 2001

The quiz is open-book, open-notes, closed neighbor. 25 Minutes. Show all your work.

1. (10) Consider an 80 kb/s network link connecting the earth to the moon. The moon is about 1.5 light-seconds from earth. If 1-Kbyte packets are sent over this link using a stop-and-wait algorithm for reliable delivery what data transfer rate can be achieved?
   A: stop-and-wait sends 1 packet per round-trip-time. 1Kbyte/3 seconds = 2.6Kbit/s

   (10) If instead, a sliding-window algorithm is used for reliable delivery, what data transfer rate can be achieved assuming that errors are infrequent.
   A: when errors are infrequent, sliding window will achieve the full bandwidth of the link, thus 80kbit/s.

   (10) What is the minimum number of bits required in the packet sequence number field to be able to achieve this rate?
   A: achieving full rate requires a send window of at least the bandwidth x delay product = 240kbit = 30 kbyte = 30 packets. The sequence number space must be at least 2 times the send window size, so 6 bits are needed (2^5 = 32 is too small, 2^6 =64 works).

2. (10) Consider the CRC divisor polynomial $C(x) = x^6 + x^2 + x + 1$ and the message 101101. What is the sequence of bits corresponding to the message with the appended CRC?

   A: 101101001010.

   (5) Is this CRC divisor polynomial able to detect any odd number of errors in the

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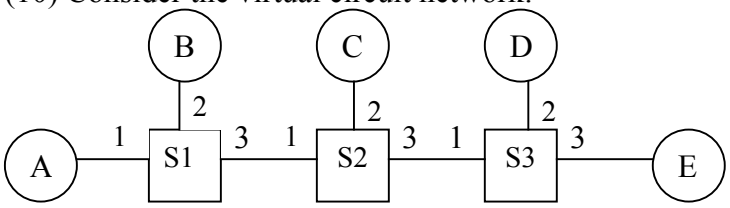
received bit string? Why or why not?
A: yes, any divisor polynomial with $x+1$ as a factor will detect any odd number of errors.

$C(x) = x^6 + x^2 + x + 1 = (x+1)(x^5 + x^4 + x^3 + x^2 + 1)$

3. (10) Consider the virtual circuit network:



with virtual circuit tables mapping, in both directions, input (port, VCI) to output (port, VCI) as follows

Input/Output	Output/Input
(Port,VCI)	(Port,VCI)
(1,2)	(3,1)
(1,1)	(2,3)
(2,1)	(3,2)

Input/Output	Output/Input
(Port,VCI)	(Port,VCI)
(1,1)	(3,3)
(1,2)	(3,2)

Input/Output	Output/Input
(Port,VCI)	(Port,VCI)
(1,3)	(2,1)
(1,2)	(3,1)

List all endpoint to endpoint connections in this network.

A: A is connected to D, A is connected to B, B is connected to E