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Computer Networks - Subjective

Total Points: 60 Time Allowed: 2 hours

Question1: (2+2+2+4+6)

What should be the sampling rate for reconstructing a filtered signal of bandwidth B?

Answer:
_____2B_____

Using Nyquist theorem, which signal property can be used to achieve higher data rates on a channel with bandwidth B?

Answer: _____Symbol/Voltage Levels_____

Is there any channel property that Nyquist overlooked while deriving equation for Maximum data rate of a channel? If yes, state property name. If No then state reason why Nyquist theorem is perfect for data rate calculations?

Answer:
_____Noise_____

Why 35kbps is the maximum Shannon limit for the data rate of the telephone systems (PSTN)?

_____ ___Calculated for average PSTN local loop_____

Signal to noise ratio in a typical telephone system is 30db and the channel bandwidth is 4kHz.

a. What is the maximum bit rate possible?

_____39868 bps_____

b. What is the number of voltage levels to achieve this bit rate?

_____31.64 or 32 levels_____

Rough work (will not be marked)

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Question2: (2+3+3)

Following character encoding is used in a data link protocol

A: 01010111

B: 11101011

ESC: 11100111

FLAG: 11101111

Show the bit sequence transmitted for the following data with each of the following framing schemes

Data: A ESC FLAG ESC FLAG B

1. Character Count

_____110 A ESC FLAG ESC FLAG B

_____

2. FLAG Bytes with byte stuffing

_____FLAG A ESC ESC ESC FLAG ESC ESC ESC FLAG B
FLAG_____

3. Starting and ending flag bytes with bit stuffing (hint: the flag mentioned here is different than the data FLAG given above, remember bit stuffing flag?)

_____**01111110** 01010111 11**0**100111 11**0**101111 1**0**1100111 11**0**101111 1**0**1101011 **01111110**___

Question3: (4)

The generator polynomial **11101** is agreed between sender and receiver. Assume that the receiver receives the bits **1101010100110**. Is the data received same as the data sent? Show your working.

Answer: _____

Nops! Remainder is coming out to be: 1110 and Quotient is 10100100

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Question 4: (3+3)

Fill in the following table by writing names of two network devices (devices that are used for inter connections) that are used at each layer

Layer	Device1	Device2
Physical Layer		
Data Link Layer		
Network Layer		

Give one line description of each of these devices. Your description should explicitly state the use of the device at a particular layer of the OSI reference model

Bridge or
Hub:_____

Router:_____
__

Switch:
_____

Question 5: (1+1+2)

Suppose there is a 10 Mbps microwave link between a geostationary satellite and its base station on Earth. Every minute the satellite takes a digital photo and sends it to the base station. Assume a propagation speed of 2.4 x 10^8 meters/sec. (remember that Satellites are 36000 km away from earth)

a. What is the propagation delay of the link?

_____0.15
sec_____

b. What is the bandwidth-delay product**,** $\boldsymbol{R \cdot d_{prop}}$?

_____1500 000
bits_____

c. Let x denote the size of the photo. What is the minimum value of x for the microwave link to be continuously transmitting?

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_____600
Mbits_____

_____

_____

_____

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Question 6: (4+6)

a. Do you think the distance vector routing protocol is scalable? Please describe the reason to support your answer (Scalable means that a protocol performance does not degrade as the network size increases).

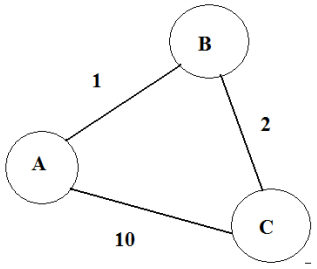
Your Answer: ____Yes_____

Reason: _____Vector Aggregation, Avoids flooding_____

_____

_____

b. Calculate the shortest paths using DV algorithm for the following 3 node network. Show all the tables and your working through iterations.



Stabilizes in two iterations

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Question 7: (2+2+1+2+3+2) Consider the figure given below. Assuming TCP Reno is the protocol experiencing the behavior shown below, answer the following questions

a. Identify the intervals of time when TCP congestion avoidance is operating. Explain.

_____[6, 16] [17, 22], linear increase_____

_____

b. After the 16th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout? Explain _____Tripple ACK, otherwise cwnd would have been 1_____

_____

c. What is the initial value of ssthresh at the first transmission round?
_____32_____

d. What is the value of ssthresh at the 18th transmission round? Why? _____21, loss at cwnd of 42_

_____ _____

e. Assuming a packet loss is detected after the 26th round by the receipt of a triple duplicate ACK, what will be the values of the congestion window size and of ssthresh? Explain

___cwnd 4+3, ssthresh
4_____

_____

f. Suppose TCP Tahoe is used (instead of TCP Reno), and assume that triple duplicate ACKs are received at the 16th round. What are the ssthresh and the congestion window size at the 17th round?

_____cwnd 1, ssthresh
21_____

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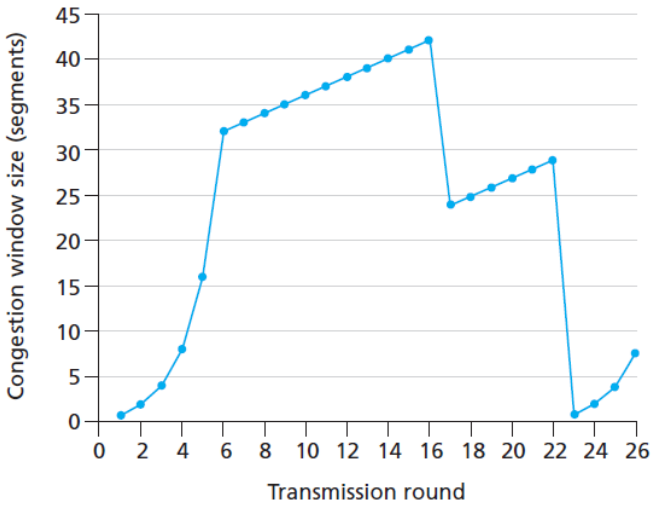
Congestion window size (segments)
45
40
35
30
25
20
15
10
5
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26
Transmission round