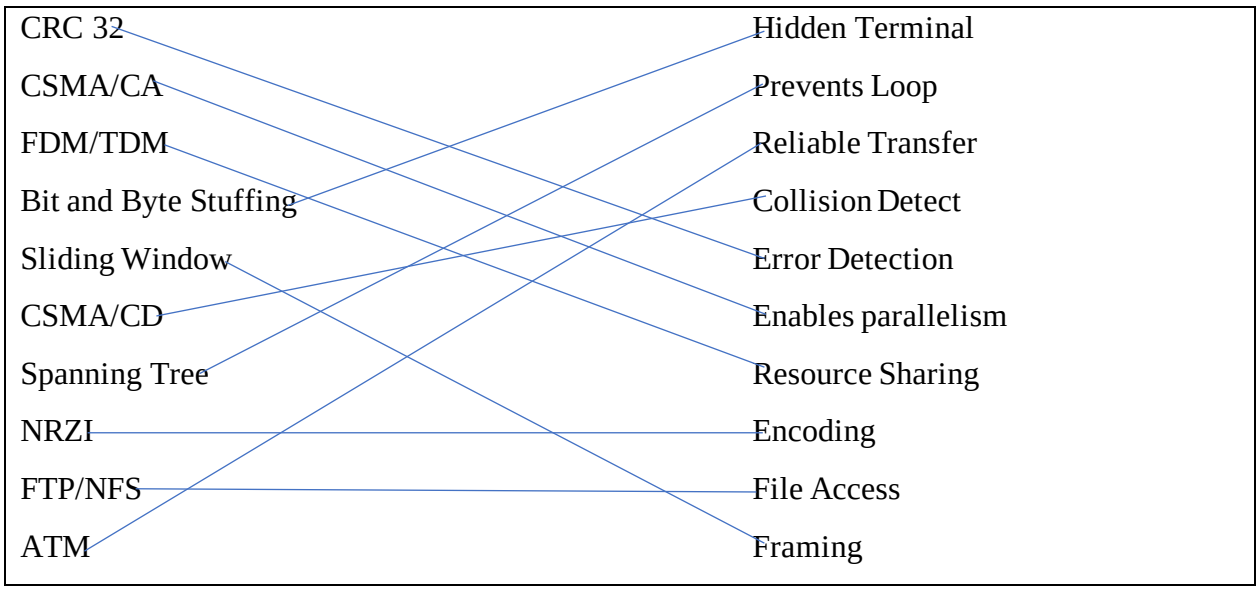
CSC 4200 Test 1
February 16th, 2022, 5:30 – 6:45 PM
Total 100 Points

1. **Map the protocol at the left side with the problem that it solves on the right by drawing arrows or lines – 10 pts**



2. Determine the following statements if they are true or false. Right T (True) or F (False) on the Left Blank space. – 10 pts

2.1 **True** We can use a MAC address for Layer 3 addressing

2.2 **False** Parity bit can catch all errors in a bit stream

2.3 **True** Circuit switching provides better quality of service than packet switching

2.4 **True** We can always represent a network as a loop free graph

2.5 **False** A server servicing ftp requests in a network is an end node of the network

2.6 **False** 4B/5B implements does not care about Consecutive 1s

2.7 **False** Error Correction is always better than Error Detection

2.8 **True** It is beneficial to have Larger receiving window than the Sending window in Sliding Window Protocol

2.9 **True** Ethernet protocol supports multi access network. If 10 nodes are connected via ethernet, all the 10 nodes can transmit data at the instant of time.

2.10 **True** Spanning tree algorithm always find out the best possible shortest route to the destination while eliminating the loops.

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3. Answer any five of the following seven questions. – 5 * 3 = 15 pts maximum

3.1 If a switch did not know where to forward a frame, what do you think it would do?

It will flood the frame to every other port excluding the receiver.

It will insert the source mac address into MAC Address table and forwards the frame to every port.

3.2 What is the hidden terminal problem and how do we solve it?

It is a situation that arises when two or more stations who are outside each other's ranges transmit data to a common recipient at the same time.

This can be solved using RTS and CTS frames using the process below.

A station that needs to transmit data can send a RTS frame to the receiving station.

- The receiving station will reply by a CTS frame.
- On receipt of CTS frame, the transmitter station begins transmission.
- Any station listening to RTS remains off till the CTS. Any station listening the CTS and is in proximity of the receiver remains off during the data transmission.

3.3 What would happen if you have two nodes with the same ID in a spanning tree?

Traditional Telephone lines make use of a dedicated connection in analog telephones.

There is a dedicated path for communication as proposed by circuit switching.

3.4 What is an example application that runs on the Internet where a circuit switched dedicated path makes more sense than a packet switched network?

Traditional landlines make use of a dedicated connection in analog telephones.

3.5 What do you think happens when both the data bits and parity bits are corrupted?

3.6 Write three differences between CSMA/CA and CSMA/CD

CSMA/CA is generally used in wireless networks. CSMA/CD is generally used in wired networks. CSMA/CA minimizes the risk of collision. CSMA/CD reduces the recovery time.

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3.7 Circuit switching can support more users than packet switching with the same number of resources. Why or why not?

Packet switching can support more users than circuit switching, because packet switching uses shared resources while circuit switching uses dedicated resources that cannot be split to support others.

4. For each of the following operations, mention if you should be concerned about delay, bandwidth, or jitter (the answer may be a combination of these)? – 10 pts

a) Remote login: Delay

b) Very large file transfers: Bandwidth and jitter

c) Interactive gaming: Delay and jitter

d) Web browsing: Delay and bandwidth

e) Video conferencing: Delay and jitter

5. Imagine the following scenario: a phone is downloading a 100MB (assume base 2 for this exercise. 1KB = 1024 bytes) video from a computer. The connection setup between the phone and the radio tower is 5 RTT. You may assume the rest of the infrastructure is already connected. Transmission rate of all links are 100Mbps (1Mb = 1000Kb), and distance of each hop is 30KM. The speed of the signal is 300,000KM/sec. Assume no queuing delay. – 20 pts

Data size = 100MB
Transmission rate: 100Mbps
Distance of each link – 30KM, Speed of Signal – 300,000KM/sec (See next page...)

a) What is the total end-to-end delay? Explain in one sentence how you calculated it. **10 Pts**

0.0008 seconds

Propagation delay equals distance/time (30/300,000) equals 10 (-4), so 1 RTT for packet that was used for connection establishment = 2*0.0004 = 0.0008

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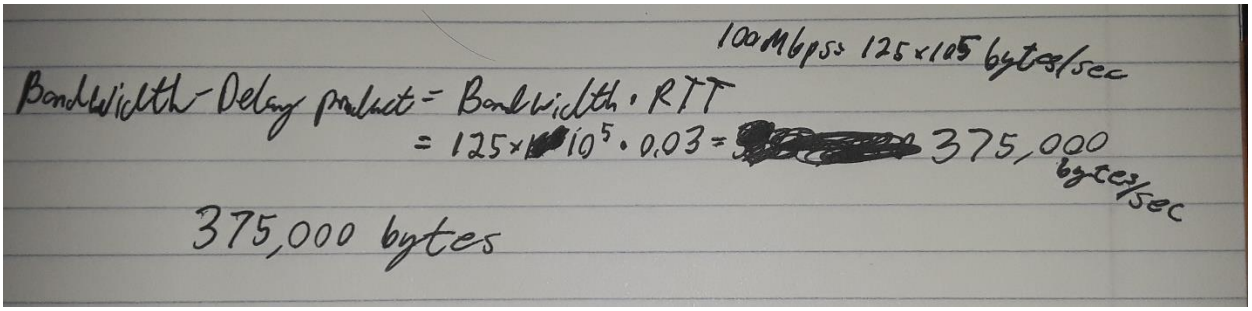
b) What is the total delay if the link between the phone and the radio tower loses all data for two seconds and the server re-transmits them? Explain in one sentence how you calculated it. **10 pts**

0.824 seconds

Total time for video transfer = transmission time for video transfer + propagation delay + connection establishment time

6. Assume you are connecting two machines over a network with 100Mbps bandwidth and 30ms round-trip time. If the sender always sends at the full capacity of the network and never stops, how many bytes are "in-flight" through the network at any given time? - 5Pts

In-flight = RTT



7. Circle the errors (flipped bits) in this 2-d parity table (odd parity). 10 pts

1	1	0	0	0	1
0	1	**1**	0	1	1
1	1	0	0	**0**	0
1	0	1	0	1	0
1	1	0	0	1	0
1	1	0	1	1	0

8. In the Ethernet transmitter algorithm, once an adaptor has detected a collision, it waits a certain amount of time and tries again. After the fifth collision, what is the probability that a node chooses K=8? (Hint: Exponential Backoff) – 5 pts

K=8 = (1/32) = 0.03

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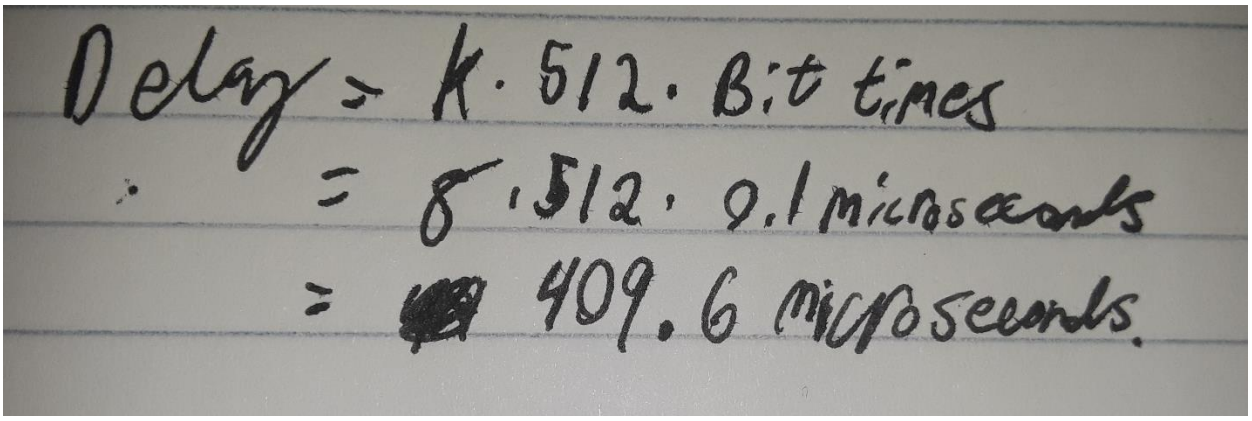
9. In the question above, the result K=8 corresponds to a delay of how many seconds on a 10 Mbps Ethernet? – 5 pts



10.– 10 pts

*****Use- 1Mbps = 10^6 bps, and 1KB = 1024 Bytes**

(Hint: Compute RTT, Delay*Bandwidth, determine number of frames required, to keep the pipe full)