CPE348 Exam 1

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What are the 2 problems of using Non-Return to Zero (NRZ) encoding?	Baseline wander, clock synchronization
What is the difference between a connection-less service and a connection oriented service?	In CO, source knows the route to destination BEFORE data transmission. In CL it does not.
Explain the stop-and-wait ARQ protocol. What is its main drawback?	A combination of ACK and Timeout to implement reliable delivery. Low efficiency
Even parity has an even number of ___'s in each row and column.	1
Explain why CSMA/CD cannot be used in a wireless environment?	"Hidden/exposed node problem" (Basically, in wireless the nodes are all hidden to each other vs. in Ethernet, the nodes know where each other are and are always listening to the traffic of the network. Wireless nodes go to sleep when waiting on a new transmission rather than constantly listening)
Suppose a sliding window algorithm is implemented using a SWS=4 and a RWS = 3, will 6 sequence numbers (i.e. 0, 1, 2, 3, 4, 5) be sufficient to correctly distinguish all packets that are received?	"Yes, no problem" (if SWS = RWS, MaxSeqNum > 2*SWS -1) (or if SWS > RWS, MaxSeqNum may be less than this)
Latency Formula	L(t) = T(t) + P(t) + Q(t) (Latency = Transmission + Propagation + Queueing)

Propagation Formula	P(t) = length/speed of light
Maximum frame size to be sufficient for CSMA/CD	T(t) > 2 P(t) (Transmit time must be at least 2 times greater than propagation time)
Transmission Time Formula	size in bits/bandwidth in Mbps
RTT Formula	(distance/c)*2
Throughput Formula (also effective data rate)	transfer size/transfer time
Transfer Time Formula	RTT + (1/bandwidth) + transfer size
Bandwidth Definition	Measure of capacity of a link or connection. (Usually given in bits/seconds, also known as Data Rate)
Mnemonic device to remember OSI Layers (top to bottom)	All People Seem To Need Domino's Pizza
OSI Layers (top to bottom)	Application Presentation Session Transport Network Data-Link Physical
Which OSI layer holds the MAC addresses	Data-Link Layer
Which OSI layer holds the IP addresses	Network Layer
KB	1024 bytes
kb	1000 bits
DelayxBandwidth Product	Used to measure how much data can be in transit on the network. (How many bits the sender must transmit before the first bit arrives at the receiver if the sender keeps the pipe full) (Delay = RTT here)

Why is error detection implemented in different layers of the OSI model?	1. Each layer has a different vulnerabilities that other layers cannot check for. 2. Since the layers are separate, an error can be caused between the layers.
It is possible to detect the following types of errors by a C(x) generator with degree r using CRC:	All single bit errors (as long as the x^r and x^0 terms have non-zero coefficients) All double bit errors (as long as C(x) has a factor with at least three terms) Any odd number of errors (as long as C(x) contains the factor (x+1)) Any "burst" error (i.e. sequence of consecutive bits) (as long as the length of the burst is less than r bits)
IP Checksum	Adds up all the words that are transmitted and then transmits the 1s complement of the sum. (Error detection that is not as good at detecting errors but very easy to implement)
2D Parity (in BiSYNC)	Uses a parity bit for the columns and rows in a section. (A block of 6 7bit strings would require 14 extra bits to use 2D parity, 7 for the side and 7 for the bottom)
2D Parity error detection capabilities	Catches all 1, 2, 3 bit errors. Most 4-bit errors (doesn't like squares). (Max guaranteed to catch is 3 bits)
Encode Definition	Converting a stream of binary data to a stream of pulse signal
Hidden Nodes	two nodes that are in range of each other but have a node between them accidentally send their transmissions to that node (solve by using RTS and CTS messages)
Which ARQ method is more efficient: stop-and-wait or sliding window?	Sliding window
NRZ cons:	Too many consecutive 1s or 0s can affect the average, and causes baseline wander. The consecutive 1s or 0s can also impact clock synchronization/recovery.
NRZI pros/cons:	Solves the NRZ problem for consecutive 1s, but not 0s

Manchester pros/cons:	Solves the NRZ problem for consecutive 1s and 0s but doubles the rate and consumes more bandwidth (50% efficient)
4B/5B pros:	Solves NRZI problem with consecutive 1s by adding an extra bit to break up 1s and 0s. Efficiently uses 80% bandwidth.
Switch as mechanism vs. device	allows us to interconnect links Vs. transfers packets from an input to one or more outputs
Which layer does the switch function on?	2 (data-link)
Circuit Switching	Entire message is sent from source -> destination without being divided into packets.
Packet Switching	Message is first divided into manageable packets at the source, packets are assembled at the destination after transmission.
Connectionless Packet Switching example	IP (the internet)
Connection-Oriented Packet Switching example	ATM
Connection-Oriented Circuit Switching example	Telephony (think old timey call centers with operators and switch boards)
Using CRC, if the destination detects no errors in the packet then the remainer will be	0
Virtual circuit switching provides a connection _____ service	oriented (You first set up a virtual connection from the source to destination then send data)
How to do VCI numbers	When a new connection is created, we assign a new VCI for that connection on each link that the connection will traverse. Each time the connection is used after, the VCI will increase by 1. Typically, the VCIs start at 0, but they may sometimes be assigned as other numbers if specified.

Centralized approach to establishing a virtual circuit	The network administrator will configure the state (Not very feasible for a large network, especially one with a small budget)
Distributed approach to establishing a virtual circuit	A host can send messages into the network to cause the state to be established (preferred)
Using virtual circuit switching, when host a no longer wants to send data to host b, it sends a _____ message	teardown
Virtual circuit connection request requires at least ____ _____ of delay before data is sent	one RTT
ATM (Asynchronous Transfer Mode)	Based on virtual circuit switching, connection-oriented packet-switched network, packets are called cells
Why is it not the best idea to connect a pair of Ethernets using a repeater?	Might exceed the physical limitations of the Ethernet (max 2500 total length allowed) (Alternative is using bridges)
Extended LAN	Connection of LANs connected by one or more bridge
Simplest strategy bridges vs. Learning bridges	Simplest forward frames from one input to ALL outputs, learning will forward only to the necessary ports
Why do we need to use the extended spanning tree algorithm on extended LANs using learning bridges?	The bridges forward each packet to the next bridge if the destination is not on their table, which may accidentally form a loop back to the current bridge and mark it as the destination. ST is used to ensure the graph covers all vertices but contains no cycles.
Spanning tree configuration message format	(Y, d, X) Y = root d = distance from that root X = sender

How many bytes make up an IPv4 header address?	4
How many bytes make up a MAC address?	6
Which OSI layers are necessary for intermediate nodes (for forwarding packets) in a network?	Network, Data Link, Physical (bottom 3)
Maximum Packet Size	delay * bandwidth (plus any extra bits such as jam signal)
Bit Stuffing	Adds a 0 after 5 consecutive 1s as stuffing. Used in HDLC/CRC
What are the drawbacks to a large minimum packet size?	Wasted Bandwidth