EXAM II

1) Multilple Choice (22 Points)

The most popular type of network cable because it is easy to install and inexpensive?

- Coaxial
- twisted-pair
- fiber optic

A bridge filters traffic using which type of address?

- IP address
- MAC address
- TCP address

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This network topology uses tokens. Only the computer with the token can send and receive data. Therefore you don't have any collisons.

- Bus
- Ring
- star

Active hubs can ___?

- route the signal using the most efficient path
- send an acknowledgement once the packet is received
- regenerate the signal like repeaters

One important difference between routers and bridges is that when a bridge can't locate the destination address in its table it ___?

- sends the transmission to the default router
- dumps the packet
- broadcasts the transmission to all ports

If the destination of the packet is outside the local network then the packet is sent to the ___?

- Switch
- Bridge
- default router

The most common topology in use today among corporate users?

- Bus
- Ring
- star-bus

Network connection device that is capable of sending packets along multiple paths depending on which path is the most efficient?

- Bridge
- Router
- all of the above

The assignment of a subscriber to a new cell is referred to as

- Power adjustment

- Handoff
- Conversion

The type of wireless networks that allows 2 clients to communicate directly to each other?

- Ad hoc
- Infrastructure
- Roaming

What is the type of wireless networking that requires the use of access points?

- Ad hoc
- Infrastructure
- Roaming

(2) TRUE/ FALSE **(9 POINTS)**

- The "Base" in 10BaseT refers to the Baseband signaling method. This means that when a station does transmit, it will use the entire bandwidth on the wire and will not share it. T
- Backoff in ETHERNET is when two packets are sent and collide with each other. F
- Adjacent channel interference can be reduced by 3-cell repeat pattern technique. T
- Absence of receiver in coverage area is detected by 4-way handshake procedure. T
- DSSS networks are inherently able to provide 3 to 4 times more total network capacity than FHSS networks. F
- Data from DSSS products is more easily intercepted than data from a FHSS product T

(3) FAST ETHERNET **(10 POINTS)**

How many messages per second can a **Fast** Ethernet LAN handles if it has a normalised throughput of 0.4 and the messages are 100 characters long using ASCII 8 bit codes.

$R = 100\text{Mbps}$ $U_N = 0.4$ $N = 100 \times 8 = 800$ bits

$U_N = \frac{X}{R} \Rightarrow X = 0.4 \times 100 \times 10^6 = 40 \times 10^6$ bits = amount of data transmitted

$\Rightarrow$ No of messages $= \frac{40 \times 10^6}{800} = 0.5 \times 10^5 =$ 50000 messages.

4) IDLE RQ (STOP AND WAIT) **(10 POINTS)**

A channel has a data rate of 4 Kbit/s and a propagation delay of 20 ms. For which frame size does "stop and wait" give an utilisation of at least 50% ?

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$R = 4\,kbps \quad T_p = 20ms \quad N = ? \;/\; U \geq 0.5$

$U = \frac{T_{ix}}{T_t} = \frac{T_{ix}}{2T_p + T_{ix}} \Rightarrow 0.5 = \frac{N/R}{N/R + 2T_p} \Rightarrow 0.5 = \frac{\frac{N \times 10^{-3}}{4}}{\frac{N \times 10^{-3}}{4} + 40 \times 10^{-3}}$

$\Rightarrow \frac{1}{8} N \times 10^{-3} + 20 \times 10^{-3} = \frac{1}{4} N \times 10^{-3} \Rightarrow \frac{1}{8} N = 20 \Rightarrow \boxed{N = 160 \text{ bits}}$

5) THROUGHPUT CALCULATION **(15 POINTS)**

Assume that an Ethernet LAN has a throughput of $U = \frac{1}{1+5a}$ where $a = \frac{T_p}{T_x}$.

Which frame size gives you the maximum throughput? Prove your answer numerically.

Consider your LAN is made of a coaxial cable of 500 meters and that the signal velocity is $2.3 \times 10^8 m/s$.

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$U = \frac{1}{1+5a} \qquad a = \frac{T_p}{T_x}$

$N = ? \;/\; U \text{ is max} \qquad V = 2.3 \times 10^8 m/s \qquad d = 500m$

$T_p = \frac{d}{V} = \frac{500}{2.3 \times 10^8} = 2.174 \times 10^{-6} s \qquad T_x = \frac{N}{R} = 10^{-7} N$

$\Rightarrow a = \frac{T_p}{T_x} = \frac{2.174 \times 10^{-6}}{10^{-7} N} = \frac{21.74}{N} \Rightarrow U = \frac{1}{1 + \frac{5}{N} \times 21.74} = \frac{1}{1 + \frac{108.7}{N}}$

$= \frac{N}{N + 108.7}$

$\Rightarrow U \text{ is max when } N \text{ is max}$

In Ethernet LAN, $N_{max} = 1518$ bytes

$\Rightarrow N$ should be equal to $1518 \times 8 = 12,144$ bits ✓

$\Rightarrow U = \frac{12144}{12144 + 108.7} = 0.99112$

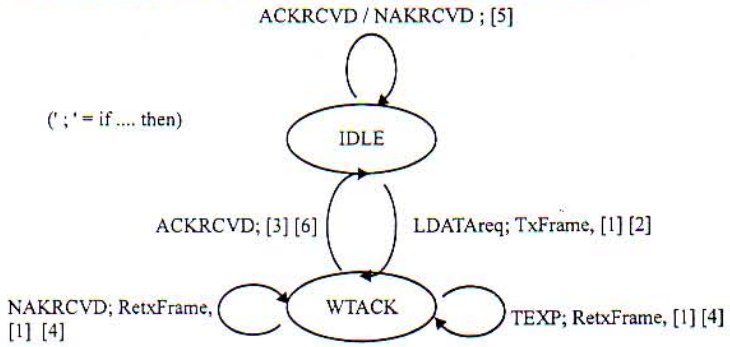
6) STOP & WAIT PROTOCOL **(9 POINTS)**

The possible actions taken in Idle RQ protocol, primary are the following:

[1] start_timer. [2] Increment Vs. [3] Stop timer. [4] Increment RetxCount.
[5] Increment ErrorCount. [6] Reset RetxCount to zero.

(where Vs = Send sequence variable)

Fill in the following diagram the 9 missing appropriate actions



7) LAN Performance (15 POINTS)

Assume that a file with a million characters is transmitted from one station to another. Compute the *total transmission time* and the *effective throughput* for the following cases:

A LAN with a bus topology with 2 stations at distance 1km from each other. Each packet is acknowledged with a 100 bit packet before the next packet is sent.

The propagation speed on the bus is $2 \cdot 10^8$ m/s. The bit rate is 10 Mbps and the packet size is 2560 bits with 80 bits of overhead

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~~10000~~ 10^6 characters

$d = 1km$ $N_{ack} = 100$ bit $V = 2 \times 10^8$ m/s $R = 10$ Mbps

$N = 2560$ bit $+ 80$ bit $= 2640$ bit.

a) $T = T_x + 2T_p + T_{ack} = \frac{2640}{10^7} + \frac{10^3}{2 \times 10^8} + \frac{100}{10^7}$

1 T_p for the frame
1 T_p for the ACK

$= 2.64 \times 10^{-4} + 0.5 \times 10^{-5} + 10^{-5} = 2.79 \times 10^{-4} s = 279\ \mu s$

b) ~~Data transmitted / unit of time~~ $U = \frac{\text{Data transmitted / unit of time}}{R}$

$\Rightarrow U_{eff} = \frac{264 \text{ bits} / 2.69 \times 10^{-4} s}{10^7 \text{ bits/s}} = 0.981$

or $U_{eff} = \frac{T_{ix}}{T_{ix} + T_p} = \frac{2.64 \times 10^{-4}}{2.64 \times 10^{-4} + 0.05 \times 10^{-4}} = \frac{2.64}{2.69} = 0.981$

$U_{eff} = \frac{N_{bit}}{T_{total}} = \frac{8 \times 10^6}{2.89}$

8) Ethernet Hubs **(10 POINTS)**

a) In a switched Ethernet hub the frames are only delivered to the addressed computer. What additional functionality is needed in a switched Ethernet hub compared to an ordinary Ethernet hub?

The additional functionality needed is to have a router.

Switching funct-

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b) What is the greatest advantage with using a switched Ethernet hub compared to an ordinary Ethernet hub? Motivate your answer.

First a switched Ethernet hub is more secure than an Ordinary Ethernet hub. However, this is not the most important advantage. ~~This~~ The most important advantage is that in switched Ethernet hub, ~~collisions are less possible to occur than in ordinary Ethernet hubs. This is because only~~ more than 1 frame can be sent on the LAN on condition that no 2 frames should be sent to the same receiver or else collision will occur. In ordinary Ethernet hubs, only 1 frame can be transmitted at a time.