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Computer Networks Class Test 5

Q1.
18CS30021
=> 18CS21

0x31 0x38 0x43 0x53 0x32 0x31

0011 0001 0011 1000 0100 0011 0101 0011 0011 0010 0011 0001

For finding 16-bit internet checksum, group binary digits in groups of 16 and add them

1s complement addition
0011 0001 0011 1000
0100 0011 0101 0011
0011 0010 0011 0001

1010 0110 1011 1100

Checksum = 1s complement of 1010 0110 1011 1100 = 0101100101000011

Receiver side :

The received data is divided again into parts of 16 bits and added with checksum

Sum + Checksum = 1010011010111100 + 0101100101000011
= 1111111111111111.

Taking complement = 0000000000000000
Hence, the result is 0.

The Receiver assumes no error occurred in the data and therefore accepts it.

Q2.
(a) Source IP : 10.0.0.1 (IP of H1)

Destination : IP: 10.0.1.1 (IP of H2)
Source : MAC: 00:0a:95:9d:68:16 (MAC of H1)
Destination : MAC: 00:b7:91:8d:12:0a (MAC of R1-eth1)

(b) Source IP : 10.0.0.1 (IP of H1)
Destination : IP: 10.0.1.1 (IP of H2)
Source MAC : 00:0a:95:9d:68:16 (MAC of H1)
Destination MAC : 00:1B:44:11:3A:B7 (MAC of H2)

(c) R1 uses ARP lookup to find out the destination MAC for the packet. R1 broadcasts the packet to all the neighboring devices using an ARP request message. Each neighboring device matches the next hop IP with its own and if there's a match, it sends an ARP reply with its MAC as the destination MAC for R1. This is how Address resolution protocol works.

Q3.

Carrier Sense Multiple Access or CSMA method was developed to minimize the probability of collision and thus, to increase the performance. The probability of collision can be minimized if a station senses or reads the medium before trying to use it for sending data.

The CSMA method does not tell us what to do in case there occurs a collision. For CSMA/CD to work, a particular frame size is required.

Now in CSMA/CD, the size of the frame must be large enough so that collisions can be detected by the sender while sending the frame. So, the frame transmission delay must be at least two times the maximum propagation delay.

Mathematically,

Transmission delay = Tt = S / B (where S is the size of the frame and B is bandwidth speed)

Propagation delay = Tp = L / P (where L is the distance between the farthest nodes and P is propagation speed)

As **Tt >= 2 * Tp**, we get

S / B >= (2 * L) / P

=> **S >= (2 * L * B) / P**

My roll number is 18CS30021, hence N = 21 and thus, N%4 + 1 = 2

Frame size = S;

Then **S >= (2 * B * L) / P**

We have,

Bandwidth B = N%$ + 1 = 2 Gbps = 2 * 10^9 bps
Cable length L = 1km = 1000m
Propagation speed P = 2 * 10^8 m / s
Hence

2 * B *L = 2 * 2 * 10^9 * 10^3 = 4 * 10^12
Thus,

(2 * B * L) / P = (4 * 10^12) / (2 * 10^8) = 2 * 10^4 = **20000 bits**
Hence minimum frame size for the cable is 20000 bits