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A1.
Converting 18CS48 to ASCII, we get
00110001 00110111 01000011 01010011 00110110 00110010 (Spaces are given for understanding)

Using 16bit checksum,
0011000100110111+0100001101010011+0011011000110010 = 1010101010111100

1s complement of 1010101010111100 = 0101010101000011

Thus the server-side msg is a 64-bit msg:
0011000100110111 0100001101010011 0011011000110010 0101010101000011

Assuming no error in transmission, the receiver gets the above msg.
To check that there is no error, we divide it into four 16 bit binary numbers and check the complemented value of their sum(which should be zero for no error).
Thus at receiver side,
complement(0011000100110111+ 0100001101010011+0011011000110010 + 0101010101000011) = complement(1111111111111111) = 0

Since the result is 0, the receiver accepts it.

A2.

a. Source IP = 10.0.0.1, Destination IP = 10.0.1.1, Source MAC = 00:0a:95:9d:68:16, Destination MAC = 00:b7:91:8d:12:0a
b. Source IP = 10.0.0.1, Destination IP = 10.0.1.1, Source MAC = 00:A0:C9:14:C8:29, Destination MAC = ?
c. R1 decides about the destination MAC address of the packet is found by using the Address Resolution Protocol(ARP). An ARP request message is broadcasted on the network with the broadcast IP and MAC address. When a device receives an ARP request message such that the target protocol address is equal to its own IP address, it sends back an ARP reply with its MAC address at the target hardware address.

A3.

((N%4)+1 Gbps = (48%4)+1 = 1Gbps

The time during which the station is transmitting should have at least 2t slot width where t is time for a signal to propagate between two farthest stations to ensure successful

transmission.
Thus, there must be enough time for the front of the frame to reach the end of the cable and then for an error message to be sent back to the start before the entire frame is transmitted.

For a 1 km cable the one way propagation time = 1/200000 = 5/(10^6) = 5 μsec
Thus for both ways, it is 2* 5μsec = 10 μsec

To make CSMA/CD work, it must be impossible to transmit an entire frame in this interval.
For a speed of 1Gbps and time interval 10μsec, all frames shorter than (speed*time interval)= (1Gbps*10 μsec) = (10^9bps * 10^-5 s) = 10^4 bits can be completely transmitted.
So, the minimum frame is 10,000 bits or 1250 bytes.