CS 447-003 Networks and Data Communications
Spring 2024
Quiz #9 on April 4, 2024 (SOLUTIONS)

Your Last Three Digits: _____
(please do NOT write all of your student ID or your name)

Grade: _____

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(1) What is "IP address" (what does each IP address represent)?

IP addresses are the unique identifiers for each network interface (NIC).

(2) What is "DHCP" for?

"DHCP is for automating the managements of the IP addresses to host computers (e.g., assign an available IP address to a new host computer)".

(3) Mention two purposes of subnet mask.

(a) To find (identify) the bits for the host address in each IP address

(b) To find (identify) the bits for the subnet address in each IP address

Note: it is assumed that we (or routers) can find the bits for the domain address using the CIDR-prefix (or the domain class).

(4) How many host computers can exist for a network domain that has "/17" CIDR block-prefix?

Show all your work for full credit.

$2^{(32-17)} = 2^{15} = 2^5 \times 2^{10} = 32 \times 1024 = 32{,}768$

(5) If <u>each subnet in a domain</u> has 5,000 host computers (i.e., needs 5,000 IP addresses each) and if the domain is supposed to have 80 subnets, what is its subnet mask (answer in the standard "*x.x.x.x*" format, where '*x*' is a decimal number between 0 and 255)?

Show all your work for full credit.

- The number of the bits (just) for the host address: $\text{ceiling}(\log_2(5000)) = \text{ceiling}(12.288) = 13$ bits

- The number of the bits (just) for the subnet address: $\text{ceiling}(\log_2(80)) = \text{ceiling}(6.322) = 7$ bits

The number of the bits for the domain address $= 32 - (13 + 7) = 12$ bits

Since the subnet mask should "mask" the bits for the domain address and the subnet address,

Mask = 11111111.11111111.11100000.00000000*

    = 255.255.224.0

    RED: the domain address bits

    GREEN: the subnet address bits

    BLACK: the host address bits

Note*: Once '0' appears in the subnet-mask address bits (from the left to the right), '1' can not appear.