CSC 435/524 Computer Networks
Question Bank
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Module 1: IP Address/MAC Address and TCP/IP Suite

1.1: MAC Address

1) How the structure of an MAC address helps to make it globally unique?

2) What is the difference between unicasting, multicasting and broadcasting within a network?

3) Identify whether the following MAC addresses are global or locally unique and also identify whether they are multicast or unicast addresses?

a. 0A:5F:BC:AD:23:10
b. 49:12:AB:12:CE:FF

1.2: Class-based IP Address and Private IP Address

1) What is the maximum number of class A, class B and class C networks possible? Similarly, what is the maximum number of hosts per class A, class B and class C network? Make sure you consider all the special IP addresses that would eat up the address space before deciding the maximum number of networks and the maximum number of hosts per network.

2) Identify the class of the following IP addresses:
   a) 143.132.10.2
   b) 18.9.1.1
   c) 212.34.5.6
   d) 224.0.0.1

3) What is the difference between a direct broadcast IP address and a limited broadcast IP address?

4) What is the subnet mask for Class A, Class B and Class C IP addresses?

5) Consider the following IP addresses in the context of class-based addressing (i.e., Class A, B, C, D, etc). Identify whether the following is a network address, broadcast IP address, unicast IP address, multicast IP address or a private IP address:
   a) 143.132.10.1
   b) 229.0.1.2
   c) 16.1.255.255
   d) 10.1.1.1
   e) 172.18.12.34
   f) 202.14.12.255
   g) 156.25.32.0
   h) 202.45.69.0

6) What is a private IP address? Can it be used as the destination IP address to directly route a packet over the Internet? Why or why not? Justify your answer.

1.3: Subnetting and CIDR

1) Assume there are three Departments P, Q and R in an organization XYZ. Each of the department needs a separate subnet. The number of computers in Departments P, Q and R are 30, 10 and 47 respectively. Assume organization XYZ got a class C network prefix 212.46.98.0. Derive the following for each of the Departments P, Q and R:

i) The subnet prefix
ii) The subnet mask
iii) The directed broadcast IP address for each subnet
iv) The valid range of IP addresses for each subnet

2) Assume there are five units A, B, C, D and E in an organization. Each of the units needs a separate subnet. The number of computers in units A, B, C, D and E are 10, 15, 20, 25 and 30 respectively. Implement subnetting by choosing a proper class-based address space. Derive the following for each of the units A, B, C, D and E:

   i) The subnet prefix
   ii) The subnet mask
   iii) The directed broadcast IP address for each subnet.
   iv) The valid range of IP addresses for each subnet

3) Consider an organization that needs to host the following three divisions A, B and C to support 200, 400 and 700 hosts. Implement subnetting by choosing a proper class-based address space. Determine the following for each division/subnet:

   i) Subnet mask
   ii) Subnet prefix
   iii) Subnet broadcast address
   iv) Valid range of unicast IP addresses for each subnet
   v) Efficiency of IP address assignment.

4) What is the basic difference between subnetting and CIDR?

5) Consider the following IP addresses in the context of classless addressing (subnetting and CIDR). Identify whether the following is a subnet/network address, broadcast IP address or a unicast IP address:

a) 212.40.90.63 /26
b) 156.23.80.0 /20
c) 199.34.56.32 /27
d) 213.45.1.12 /28
e) 143.132.7.255 /21

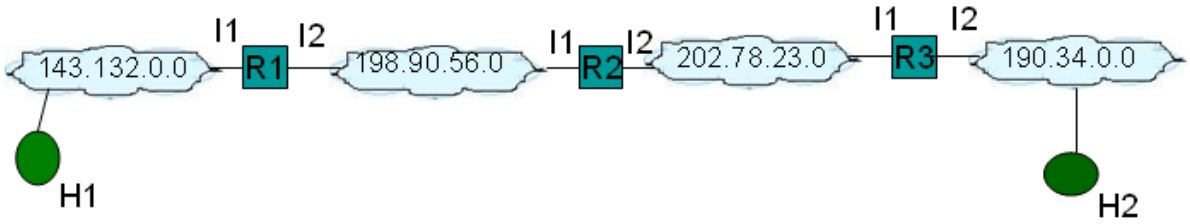
6) Why CIDR prefers to use a group of contiguous address spaces (say contiguous Class C networks) rather than arbitrary address spaces (i.e., arbitrarily chosen Class C networks)? In other words, what is the advantage with the first approach compared to the second approach?

7) Consider the use of the Classless Interdomain Routing (CIDR). Let there be a network PQR that requires the support of 700 hosts and we assign three contiguous class C network address space 212.45.16.0, 212.45.17.0 and 212.45.18.0. Compute the following for network PQR:

(1) Subnet mask
(2) Network address
(3) Broadcast address
(4) Range of valid IP addresses

1.4: End-to-End Packet Transmission across the Internet

1) Consider the following internetwork:



Host/ Router	IP address	Hardware address
H1	143.132.0.1	34:12:45:AB:CD:EF
Interface 1 of R1	143.132.90.2	38:45:A9:E2:B5:C3
Interface 2 of R1	198.90.56.1	4C:9A:3B:54:DF:12
Interface 1 of R2	198.90.56.2	24:3B:1C:4A:52:CD
Interface 2 of R2	202.78.23.1	9C:12:AB:89:CF:33
Interface 1 of R3	202.78.23.2	BC:32:11:A2:45:23
Interface 2 of R3	190.34.0.1	28:12:AB:45:69:12
H2	190.34.0.2	30:90:CD:EF:AB:43

Indicate the contents (Port numbers, IP addresses, Hardware addresses) of the TCP, IP and the Frame headers as the data passes from a process (port number 1025) running at host H1 (IP address: 143.132.0.1) to a process (port number 2045) running at host H2 (IP address: 190.34.0.2). You need to show the contents at each of the hosts H1, H2 and the routers R1, R2, R3.

Contents of the frame leaving H1 and entering R1

Source H/W	Dest H/W	Source IP	Dest IP	Source Port	Dest Port	
						DATA

Contents of the frame leaving R1 and entering R2

Source H/W	Dest H/W	Source IP	Dest IP	Source Port	Dest Port	
						DATA

Contents of the frame leaving R2 and entering R3

Source H/W	Dest H/W	Source IP	Dest IP	Source Port	Dest Port	
						DATA

Contents of the frame leaving R3 and entering H2

Source H/W	Dest H/W	Source IP	Dest IP	Source Port	Dest Port	
						DATA

2) Define the following:
    a. Datagram
    b. Segment
    c. Frame

1.5: ISO/OSI and TCP/IP Models

1) What are the 7 layers (bottom to top) of the ISO-OSI model? Briefly explain the functionality of each of these 7 layers?

2) What are the different layers (top to bottom) of the TCP/IP protocol stack? Briefly explain the functionality of each of the layers?