Computer Networks
2nd Year, 1st Semester
2020

Tutorial 2 - Sample Answers

1) State the three types of addresses, operating layer and number of bits used to represent the address used in TCP/IP.

Address Type	Operating layer	number of bits used
MAC Address	2 - Data Link Layer	48
IP Address	3 – Network Layer	32
Port Address	4 – Transport Layer	16

2) What is the version of the current IP addressing scheme and the version of the next IP addressing scheme that will be using in the future?

IPv4 – Current Version
IPv6 / IPng – Next Version

3) For IP addresses in each class show network bits and host bits by a diagram.

Class A	Network	Host		
Octet	1	2	3	4

Class B	Network		Host	
Octet	1	2	3	4

Class C	Network			Host
Octet	1	2	3	4

4) Write down the ranges of the IP address classes.

Address Class	Range of the first octet
Class A	0 – 127
Class B	128 – 191
Class C	192 – 223
Class D	224 - 239

5) Write the class, net ID and the host ID of the following addresses.

Network Address	Class	Net ID	Host ID	Network address	Broadcast Address
101.2.3.4	A	101	2.3.4	101.0.0.0	101.255.255.255
200.20.10.5	C	200.20.10	5	200.20.10.0	200.20.10.255
192.168.16.100	C	192.168.16	100	192.168.16.0	192.168.16.255
25.10.100.200	A	25	10.100.200	25.0.0.0	25.255.255.255
180.2.150.2	B	180.2	150.2	180.2.0.0	180.2.255.255

6) Find the network address and the subnet mask for the following IP addresses (Class Full).

    a. 172.19.67.3

      172.19.0.0   255.255.0.0

    b. 205.90.46.234

      205.90.46.0   255.255.255.0

    c. 123.65.89.0

      123.0.0.0   255.0.0.0

7) State the type of the following IP addresses.

    a. 172.16.25.9

      Class B , Private , IP Address of a device

    b. 192.168.89.0

      Class C, Private , Network Address

    c. 127.0.0.90

      A Loopback IP Address

    d. 255.255.255.0

      Subnet Mask of Class C

    e. 255.255.255.255

      Limited Broadcast Address

    f. 0.0.26.8

      A host of this network

8) What are two main components of an IP address?

- Network ID
- Host ID

9) Analyze the following IP addresses.
Find out which of the following addresses belong to the same network (no sub -netting / classful IP addressing). Explain why.

  I.   123.4.6.2   123.4.78.9   132.14.56.12   123.4.0.0

      123.4.6.2 , 123.4.78.9 ,   123.4.0.0 ➔ 123.0.0.0/8

  II.   10.0.0.1   10.1.1.1   10.1.2.2   11.0.0.1

      10.0.0.1 , 10.1.1.1 , 10.1.2.2 ➔ 10.0.0.0/8

  III.   172.16.16.16 172.17.16.16 173.16.16.16 173.16.16.20

      173.16.16.16 , 173.16.16.20 ➔ 173.16.0.0 /16

10) You are given the network address 180.150.0.0; you are required to have 5 subnets. What is the minimum number of Host Bits can you take in to the Network Bits for this purpose?
Write down the addresses of 5 subnets. (Write in binary where necessary). Write the subnet mask for the network.

Net ID	Subnet ID	Host ID		
180.150.	_ _ _	00000.00000000		11111111.11111111. 111 00000.00000000
			Subnet Address	Subnet Mask
180.150.	0 0 0	00000.00000000	180.150.0.0 /19	255.255.224.0
180.150.	0 0 1	00000.00000000	180.150.32.0 /19	255.255.224.0
180.150.	0 1 0	00000.00000000	180.150.64.0 /19	255.255.224.0
180.150.	0 1 1	00000.00000000	180.150.96.0 /19	255.255.224.0
180.150.	1 0 0	00000.00000000	180.150.128.0 /19	255.255.224.0
	1 0 1			
	1 1 0			
	1 1 1			

11) A company is granted the network address 203.80.64.0 The company needs six subnets. Design the subnets and subnet mask. Also write the first 2 and last 2 IP addresses of the hosts in each of those subnets.

203.80.64	_ _ _	00000		
203.80.64	0 0 0	00000	203.80.64.0 /27	Subnet address
203.80.64	0 0 0	00001	203.80.64.1 /27	
203.80.64	0 0 0	00010	203.80.64.2 /27	
			1-30 → 30 devices	
203.80.64	0 0 0	11101	203.80.64.29 /27	
203.80.64	0 0 0	11110	203.80.64.30 /27	
203.80.64	0 0 0	11111	203.80.64.31	Broadcast address
203.80.64	0 0 1	00000	203.80.64.32 /27	Subnet address
		00001	203.80.64.33 /27	
		00010	203.80.64.34 /27	
			33–62 →30 devices	
		11101	203.80.64.61 /27	
		11110	203.80.64.62 /27	
		11111	203.80.64.63 /27	Broadcast address
203.80.64	0 1 0	00000	203.80.64.64 /27	
203.80.64	0 1 1	00000	203.80.64.96 /27	
203.80.64	1 0 0	00000	203.80.64.128 /27	
203.80.64	1 0 1	00000	203.80.64.160 /27	
SNM			255.255.255.224	
203.80.64	1 1 0	00000	203.80.64.192	
203.80.64	1 1 1	00000	203.80.64.224	

12) Show the 8 subnets obtained by subnetting the address 172.16.0.0/16 , the resulting subnet mask, the corresponding broadcast addresses, and the range of valid host addresses.

Subnetwork Address	Subnet Mask	Broadcast Address	Host Address Range
172.16.0.0 / 19	11111111.11111111. 111 00000.00000000 255.255.224.0	172.16.31.255 000 11111.11111111	172.16.0.1 - 172.16.31.254
172.16.32.0 / 19		172.16.63.255	172.16.32.1 - 172.16.63.254
172.16.64.0 / 19		172.16.95.255	172.16.64.1 - 172.16.95.254
172.16.96.0 / 19		172.16.127.255	172.16.96.1 - 172.16.127.254
172.16.128.0 / 19		172.16.159.255	172.16.128.1 - 172.16.159.254
172.16.160.0 / 19		172.16.191.255	172.16.160.1 - 172.16.191.254
172.16.192.0 / 19		172.16.223.255	172.16.192.1 - 172.16.223.254
172.16.224.0 / 19		172.16.255.255	172.16.224.1- 172.16.255.254

13) Compute the sub-network address for the following IP addresses, given the subnet mask,

    I.   201.14.78.65   255.255.255.224
                201.14.78.64 / 27

    II.   180.25.21.172   255.255.255.192
                180.25.21.128 /26

    III.   18.250.31.14   255.254.0.0
                18.250.0.0/ 15

    IV.   10.30.36.12   255.255.255.0
                10.30.36.12/24

    V.   10.6.24.20   255.255.240.0
                10.6.16.0/20

14) Compute the available number of sub networks and possible host addresses in each subnet.
    a.   The subnet mask for a class C network is 255.255.255.192
                        11 000000
                  Subnet bits → 2
               Subnets → 2^2 → 4
             Device count →2^6 – 2 → 62

    b.   The subnet mask for a class B network is 255.255.224.0
                    111 00000 . 00000
               3 subnet bits → 8 subnets
            Device count → 2^{13} - 2

    c.   The subnet mask for a class C network is 255.255.255.248
                     11111 000
             32 subnets 6 devices in each

d. The subnet mask for a class A network is 255. 255.248.0

11111111 . 11111111. 11111 000. 00000000
13 subnet bits and 11 host bits

2^{13} subnets and $(2^{11} - 2)$ → 2046 devices in each

15) RH company has 9 branches in Colombo district. The company network has the network address of 152.16.0.0.
   a. Write subnet addresses which can be given to the branches.

   > 152.16.0.0 / 20
   > 152.16.16.0 / 20
   > 152.16.32.0 / 20
   > 152.16.48.0 / 20
   > 152.16.64.0 / 20 - 5th branch.
   > 152.16.96.0 / 20
   > 152.16.112.0 / 20
   > 152.16.128.0 / 20
   > 152.16.144.0 / 20 - 9th branch

   b. How many hosts can be existed in a branch?
   $$2^{12} - 2 → 4094$$

   c. Calculate the total number of available hosts in all the branches.
   $$4094 * 9$$

   d. Write the 10th available IP address of the 5th branch.
   152.16.64.10 / 20

   e. Write the last 4 IP addresses of the 9th branch.

   152.16.144.0 / 20 - 9th branch

   152.16.144.0 / 20 → 152.16 .1010   0000.00000000 – Subnetwork address

   > 152.16.159.251 /20
   > 152.16.159.252 /20
   > 152.16.159.253 /20
   > 152.16.159.254 /20

   152.16.159.255 / 20 →   152.16 .1010   1111.11111111 – Broadcast address