T6 - Exercises

1. An organization has the network IPv4 address 158.42.182.0/23 and wants to divide it into four subnets of equal size. Indicate the IP address of each of the subnets and its network mask.
2. An organization has a /16 block of addresses, to be divided into subnets. Indicate what would be the required subnet mask for the following subnets (maximizing the number of hosts on each subnet):
    a. Four equal subnets.
    b. Eight equal subnets.
    c. Five subnets, one of which is four times the size of each of the other four subnets (in this case, masks of different sizes can be used).
3. We want to divide the network address 200.35.1.0/24 into subnets of the same size. Specify the larger subnet mask that will allow at least 20 hosts on each subnet.
    a) How many hosts can be addressed on each subnet?
    b) How many subnets of this size could be created in this /24 block?
    c) List the 200.35.1.0/24 subnets in binary and dotted decimal format.
    d) List the usable address range of 200.35.1.192/27 subnet.
    e) What is the directed broadcast address for the subnet 200.35.1.192/27?

4. We want to divide the network address 155.5.64.0/20 into subnets of the same size.
    a. Specify the larger subnet mask that will allow at least 500 hosts on each subnet.
    a. How many subnets of this size could be created?
    b. Once subnets have been created, fill out the table below indicating the type of address (host, network, broadcast, special, or private address), the network address to which it belongs, and if it is a special address, give its meaning.

IP Address	Type: Host/network/broadcast/special…	Network Addr.	Meaning
155.5.66.0			
155.5.67.0			
10.0.255.1			
155.5.67.255			
155.5.73.15			
255.255.255.255			
155.5.69.255			
127.14.66.255			
155.5.78.0			
155.5.64.64			

5. We want to divide the network address 222.222.222.0/24 into 8 subnetworks of the same size. Fill out the table below indicating the subnet address to which it belongs, and the type of address (host, subnet or broadcast):

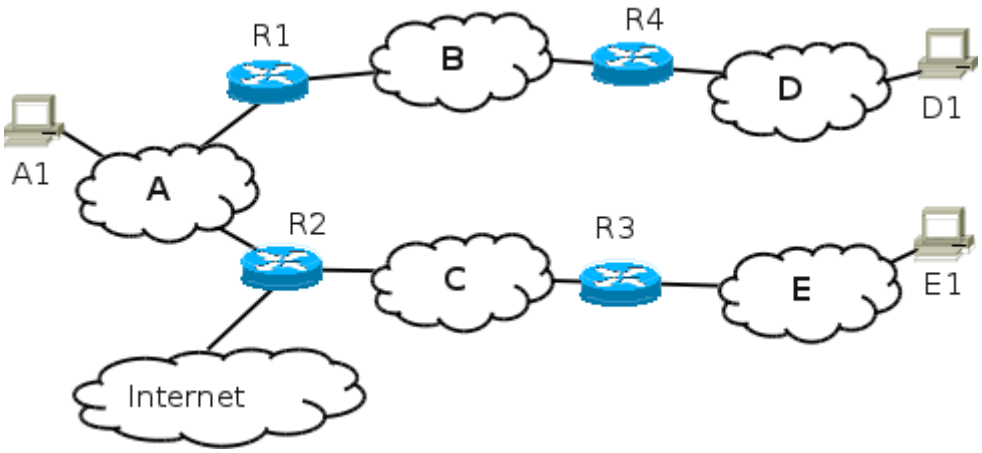
IP Address	Network Address	Type of Address
222.222.222.131		
222.222.222.160		
222.222.222.20		
222.222.222.222		
222.222.222.95		

6. Suppose an ISP has the 206.0.64.0/18 IP address block available and a customer organization needs 800 addresses.
    a. Indicate how many IP addresses the ISP has available.
    b. Specify CIDR address block suitable for the customer network (use the larger subnet mask).
    c. Write out the address allocation using C classful addresses
7. You want to build an IP network using CIDR format. This network must include, among others, the host address 215.128.132.1 and should allocate at least 900 hosts.
    a. Indicate the largest subnet address that meets these characteristics, its network mask and its broadcast address.
8. We have divided the 202.202.202.0/24 network into several subnets of the same size and have 240 total addresses assignable (among all subnets). Calculate the number of subnets that we have, and list the subnet addresses in CIDR format.
9. An organization “A” wants to connect at most 2032 computers to the Internet. At the same time, another organization "B" wants to connect at most 4064 devices to the Internet. In order for those organizations to make an optimal use of address space, the ISP assigns “A” the network address 205.10.0.0/? , and assigns "B" the address 215.25.0.0/?.
    a. Specify CIDR masks for customers “A” and “B” (use the largest subnet mask).

10. Router-1 has the following forwarding table. Analyse if it is possible to reduce the number of entries on it, and if so, reduce the number of entries to the minimum.

Destination Network	Netmask	Route	Interface
158.42.0.0	255.255.224.0	0.0.0.0	158.42.1.3
132.41.2.0	255.255.254.0	0.0.0.0	132.41.2.1
181.96.240.0	255.255.240.0	132.41.3.17	132.41.2.1
25.3.128.0	255.255.128.0	0.0.0.0	25.3.128.255
158.42.32.0	255.255.224.0	158.42.24.32	158.42.1.3
180.96.192.0	255.255.240.0	132.41.3.17	132.41.2.1
158.42.64.0	255.255.224.0	158.42.24.32	158.42.1.3
180.96.224.0	255.255.240.0	132.41.3.17	132.41.2.1
158.42.96.0	255.255.224.0	158.42.24.32	158.42.1.3
180.96.208.0	255.255.240.0	132.41.2.250	132.41.2.1
0.0.0.0	0.0.0.0	132.41.3.17	132.41.2.1

11.



Consider the set of LANs (A, B, C, D y E) connected among them by four routers (R1, R2, R3, and R4).The network connects to Internet through R2. The 5 subnetworks can use the 197.8.4.0/24 IP address, and each subnetwork needs 30 hosts at least.

a) Assign an IP address to all the elements of the networks (IP subnetworks, host, etc.).
b) Write the forwarding table of the routers, and host D1.
c) A process in D1 that uses UDP transport layer wants to send a 688 byte message to another process on a host on a remote network (Internet). Assuming the internet link (via R2) has a MTU 576 octets, indicate the following fields of the IP header: ID, MF bit, OFFSET, and length.

12. A large ISP acquires addresses from 195.15.0.0 to 195.15.255.255. After reserving 32000 addresses for its own use, the remaining ones are distributed among its four subsidiaries (A, B, C, and D). Each of these subsidiaries reserves 4000 addresses for its own use and sells all those remaining. Subsidiary A sells addresses to four companies (A1, A2, A3, and A4), with the following distribution:
    - Company A1: 1000 hosts
    - Company A2: 500 hosts
    - Company A3: 2000 hosts
    - Company A4: 250 hosts

    a. Indicate a network address for: provider, 4 subsidiaries (1,B,C, and D) and 4 companies (A1, A2, A3, and A4).

13. A given network of six nodes (from A to F) uses the link state algorithm to calculate its forwarding table. The F node has received the following link state packets (its own link state packet is also included):
From A: (B, 4) (E, 5)
From B: (A 2) (C 9) (E 10)
From C: (B 9) (D 3) (F, 20)
From D: (C, 4) (F 2)
From E: (A 5) (B 11) (F 8)
From F: (C 15) (D 3) (E 8)

    Draw the graph of the network (network topology: nodes and link cost) and calculate forwarding table of node F.

14. Calculate the forwarding table knowing that C has received the following distance vectors from its neighbours:
B (5,0,6,12,6,2), D (16,12,3,0,9,10), F (7,6,5,9,4,0). The distance of C to its neighbours is: C to B: 6, C to D: 3, and C to F: 5.

15. MTUs of networks 1 and 2 are 4500 and 800, respectively. In computer B in network 2 the following IP datagrams have been received. The sender of these datagrams is computer A in network 1.

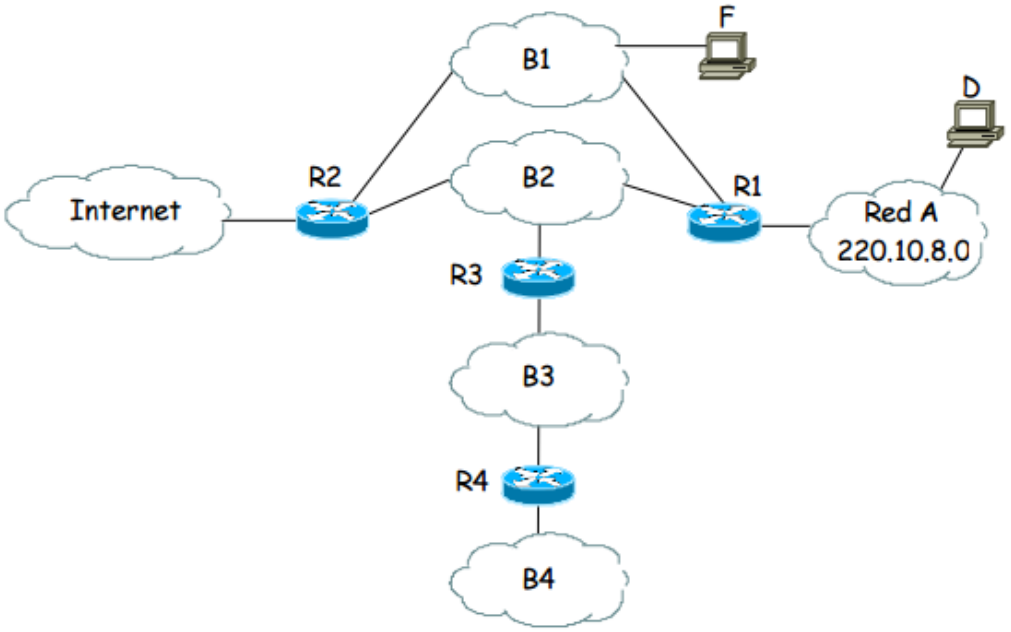
IP header fields				
Total length	***Identifier***	***DF***	***MF***	***Offset***
796	16	0	0	194
40	28	0	0	194
796	16	0	1	0
796	28	0	1	0
780	63	0	0	0
796	16	0	1	97
796	95	0	1	291
796	28	0	1	97
54	95	0	0	388

a) Is there any relationship among the datagrams? Justify your answer.

b) Fill out the following table with the values of the original datagrams sent from A.

Total length	***Identifier***	***DF***	***Flag MF***	***Offset***

16.



Consider the set of LANs (A, B1, B2, B3 y B4) connected among them by four routers (R1, R2, R3, and R4).The network connects to Internet through R2. The B subnetworks (B1 to B4) can use the 140.1.2.0/23. The netmask of network A is 255.255.248.0.

a) How many hosts can be addressed on network A?
b) Write the directed broadcast address of network A.
c) How many hosts can be addressed on network B before we create the subnets?
d) How many hosts can be addressed among the 4 B subnets (B1 to B4)?
e) Assign an IP address to all the elements of the network in such a way that the number of entries in the forwarding tables of the routers will be minimal.
f) Write the forwarding table of R1, R3, and host F. The number of entries in the forwarding tables should be minimal.