

Sheet 4 Answer

Exercise 1-

1)

RTT	Congestion Window	Receiver Window	Sending Rate
1	1	20	1
2	2	20	2
3	4	20	4
4	8	18	8
5	16	12	12
6	8	2	2
7	9	2	2
8	10	2	2
9	11	2	2
10	12	2	2
11	13	2	2
12	14	2	2
13	15	2	2
14	16	2	2
15	17	2	2
16	18	2	2

Exercise 2-

2) a) Find the class of the following IP addresses:

1) Class A

2) Class C

3) Class A

4) Class B

b) Find the maximum number of hosts that can be connected to the network in the following cases:

1) Class A IP address

24 bits for host

$$\text{Max. number of hosts} = 2^{24} - 2 = 16,777,214$$

You must subtract 2 because the base network represents host “0” and the last host on the network is actually used for “1”’s broadcast and may not be assigned to any host

2) Class B IP address

16 bits for host

$$\text{Max. number of hosts} = 2^{16} - 2 = 65,534$$

3) Class C IP address

8 bits for host

$$\text{Max. number of hosts} = 2^8 - 2 = 254$$

c) Write the following netmasks in slash (/n) notation

1) 255.255.255.0 / 24

2) 255.255.254.0 / 23

Exercise 3-

The following network is composed of four LANS: LAN , LAN , LAN , and LAN . The network addresses is class C network address 193.115.52.x Determine:

- a) Network address for each

LAN 1 :

193.115.52.0

LAN 2 :

193.115.52.64

LAN 3 :

193.115.52.128

LAN 4 :

193.115.52.192

- b) The IP address for all the hosts in the figure.

H1 → 193.115.52.1

H2 → 193.115.52.65

H3 → 193.115.52.129

H4 → 193.115.52.193

- c) The maximum number of hosts that can be connected to every LAN and the range of the IP addresses that can be given.

Maximum Number of Hosts : $2^6 - 2 = 62$

LAN 1 :

193.115.52.1 → 193.115.52.62

LAN 2 :

193.115.52.65 → 193.115.52.126

LAN 3 :

193.115.52.129 → 193.115.52.190

LAN 4 :

193.115.52.193 → 193.115.52.253

Exercise 4-

An Organization is assigned 1 class B address 160.17. The Organization has 5 departments that need to have each computer department to be connected on the same subnet. The numbers of computers in the 5 departments are: 50, 90, 44 and 120, respectively

- a) How many host bits are needed in the subnet mask?

We need 3 more bits for network to divide the IP address to 5 sub-networks
 $160.17.x.x / 19$

- b) Write down the IP address and subnet mask for each department?

Department 1: 160.17.0.0

Department 2: 160.17.32.0

Department 3: 160.17.64.0

Department 4: 160.17.96.0

Department 5: 160.17.128.0

Subnet Mask : 255.255.224.0

Exercise 5 - :

Suppose that a TCP segment that contains 2048 bytes of data plus 20 bytes of TCP header is passed to IP for delivery across 2 networks of the Internet, N1 and N2 . The network N1 uses 14 bytes of header for its data-link layer frames and has an MTU of 1024 bytes; the network N2 uses 8 bytes header with an MTU of 512 bytes. Each network's MTU gives the total packet size that may be encapsulated as data payload in a frame, including the packet's IP header Give the sizes and offsets of the sequence of fragments delivered to the IP layer at the destination host. Assume all IP headers are 20 bytes long.

Total Length 2048 when the segment reaches N1

We ignore data link header

$$MTU = 1024 - 20 - 20 = 984$$

$$2048 / 984 = 3 \text{ fragments}$$

It'll be fragmented at N1

1st fragment 984

Offset 0

2nd fragment 984

Offset 123

3rd fragment 80

Offset 246

At N2

$$MTU = 512 - 20 - 20 = 472$$

$$984 / 472 = 3 \text{ fragments}$$

First received = 984		
1 st Fragment = 472	2 nd Fragment = 472	3 rd Fragment = 40
Offset = 0	Offset = 59	Offset = 118

Second received = 984		
1 st Fragment = 472	2 nd Fragment = 472	3 rd Fragment = 40
Offset = 123	Offset = 182	Offset = 241

Third received 80

All Passes

Offset 246

Exercise 6 - :

Suppose that a host application needs to transmit a packet of 3,500 bytes. The physical layer has an MTU of 1,500 bytes. The packet has an IP header of bytes plus another attached header of 20 bytes. Fragment the packet, and specify the ID, MF, and offset fields of all fragments

Total Packet Length= 3500

MTU = 1500 -20 -20 = 1460

1 st Fragment = 1460	2 nd Fragment = 1460	3 rd Fragment = 580
ID = 5	ID = 5	ID = 5
MF = 1	MF = 1	MF = 0
Offset = 0	Offset = 182	Offset = 364