Bài 1

1. 169.123.3.8/17

IP address	169.123.3.8	10101001	01111011	00000011	00001000
Subnet Mask	255.255.128.0	11111111	11111111	10000000	00000000
Network address	169.123.0.0	10101001	01111011	00000000	00000000
First IP address	169.123.0.1	10101001	01111011	00000000	00000001
Last IP address	169.123.127.254	10101001	01111011	01111111	11111110
Broadcast IP address	169.123.127.255	10101001	01111011	01111111	11111111

2. 192.13.110.23/25

IP address	192.13.110.23	11000000	00001101	01101110	00010111
Subnet Mask	255.255.255.128	11111111	11111111	11111111	10000000
Network address	192.13.110.0	11000000	00001101	01101110	00000000
First IP address	192.13.110.1	11000000	00001101	01101110	00000001
Last IP address	192.13.110.126	11000000	00001101	01101110	01111110
Broadcast IP address	192.13.110.127	11000000	00001101	01101110	01111111

3. 10.78.21.3/12

IP address	10.78.21.3	00001010	01001110	00010101	00000011
Subnet Mask	255.240.0.0	11111111	11110000	00000000	00000000
Network address	10.64.0.0	00001010	01000000	00000000	00000000
First IP address	10.64.0.1	00001010	01000000	00000000	00000001
Last IP address	10.127.255.254	00001010	01111111	11111111	11111110
Broadcast IP address	10.127.255.255	00001010	01111111	11111111	11111111

Bài 2 Chia mạng chứa địa chỉ IP: 172.169.10.23/18 thành 6 mạng con, mỗi mạng chứa 1000 host

Để biểu diễn 6 mạng con, ta cần ít nhất 3 bit (vì $2^3 = 8 > 6$)

$\Rightarrow$ Số bit còn lại: $14 - 3 = 11$

$\Rightarrow$ Số host: $2^{11} - 2 = 2046$

IP address	172.169.10.3	10101100	10101001	00001010	00000011
Subnet Mask	255.255.192.0	11111111	11111111	11000000	00000000
Network address	172.169.0.0	10101100	10101001	00000000	00000000
Subnet Mask new	255.255.248.0	11111111	11111111	11111000	00000000

Net Add 1	172.169.0.0	10101100	10101001	00000000	00000000
First IP 1	172.169.0.1	10101100	10101001	00000000	00000001
Last IP 1	172.169.7.254	10101100	10101001	00000111	11111110
Broadcast IP 1	172.169.7.255	10101100	10101001	00000111	11111111

Net Add 2	172.169.8.0	10101100	10101001	00001000	00000000
First IP 2	172.169.8.1	10101100	10101001	00001000	00000001
Last IP 2	172.169.15.254	10101100	10101001	00001111	11111110
Broadcast IP 2	172.169.15.255	10101100	10101001	00001111	11111111

Net Add 3	172.169.16.0	10101100	10101001	00010000	00000000
First IP 3	172.169.16.1	10101100	10101001	00010000	00000001
Last IP 3	172.169.23.254	10101100	10101001	00010111	11111110
Broadcast IP 3	172.169.23.255	10101100	10101001	00010111	11111111

Net Add 4	172.169.24.0	10101100	10101001	00011000	00000000
First IP 4	172.169.24.1	10101100	10101001	00011000	00000001
Last IP 4	172.169.31.254	10101100	10101001	00011111	11111110
Broadcast IP 4	172.169.31.255	10101100	10101001	00011111	11111111

Net Add 5	172.169.32.0	10101100	10101001	00100000	00000000
First IP 5	172.169.32.1	10101100	10101001	00100000	00000001
Last IP 5	172.169.39.254	10101100	10101001	00100111	11111110
Broadcast IP 5	172.169.39.255	10101100	10101001	00100111	11111111

Net Add 6	172.169.40.0	10101100	10101001	00101000	00000000
First IP 6	172.169.40.1	10101100	10101001	00101000	00000001

Last IP 6	172.169.47.254	10101100	10101001	00101111	11111110
Broadcast IP 6	172.169.47.255	10101100	10101001	00101111	11111111

Bài 3: Chia mạng chứa địa chỉ IP: 10.24.222.21/10 thành 11 mạng con, mỗi mạng chứa 10K host

Để biểu diễn 11 mạng con, ta cần ít nhất 4 bit (vì $2^4 = 16 > 11$)

$\Rightarrow$ Số bit còn lại: $22 - 4 = 18$

$\Rightarrow$ Số host: $2^{18} - 2 = 262142$

IP address	10.24.222.21	00001010	00011000	11011110	00010101
Subnet Mask	255.192.0.0	11111111	11000000	00000000	00000000
Network address	10.0.0.0	00001010	00000000	00000000	00000000
Subnet Mask new	255.252.0.0	11111111	11111100	00000000	00000000

Net Add 1	**10.0.0.0**	**00001010**	**00000000**	**00000000**	**00000000**
First IP 1	10.0.0.1	00001010	00000000	00000000	00000001
Last IP 1	10.3.255.254	00001010	00000011	11111111	11111110
Broadcast IP 1	10.3.255.255	00001010	00000011	11111111	11111111

Net Add 2	**10.4.0.0**	**00001010**	**00000100**	**00000000**	**00000000**
First IP 2	10.4.0.1	00001010	00000100	00000000	00000001
Last IP 2	10.7.255.254	00001010	00000111	11111111	11111110
Broadcast IP 2	10.7.255.254	00001010	00000111	11111111	11111111

Net Add 3	**10.8.0.0**	**00001010**	**00001000**	**00000000**	**00000000**
First IP 3	10.8.0.1	00001010	00001000	00000000	00000001
Last IP 3	10.11.255.254	00001010	00001011	11111111	11111110
Broadcast IP 3	10.11.255.255	00001010	00001011	11111111	11111111

Net Add 4	**10.12.0.0**	**00001010**	**00001100**	**00000000**	**00000000**
First IP 4	10.12.0.1	00001010	00001100	00000000	00000001
Last IP 4	10.15.255.254	00001010	00001111	11111111	11111110
Broadcast IP 4	10.15.255.254	00001010	00001111	11111111	11111111

Net Add 5	10.16.0.0	00001010	00010000	00000000	00000000
First IP 5	10.16.0.1	00001010	00010000	00000000	00000001
Last IP 5	10.19.255.254	00001010	00010011	11111111	11111110
Broadcast IP 5	10.19.255.255	00001010	00010011	11111111	11111111

Net Add 6	10.20.0.0	00001010	00010100	00000000	00000000	
First IP 6	10.20.0.1	00001010	00010100	00000000	00000001	
Last IP 6	10.23.255.254	00001010	00010111	11111111	11111110	
Broadcast IP 6	10.23.255.255	00001010	00010111	11111111	11111111	

Net Add 7	10.24.0.0	00001010	00011000	00000000	00000000
First IP 7	10.24.0.1	00001010	00011000	00000000	00000001
Last IP 7	10.27.255.254	00001010	00011011	11111111	11111110
Broadcast IP 7	10.27.255.255	00001010	00011011	11111111	11111111

Net Add 8	10.28.0.0	00001010	00011100	00000000	00000000
First IP 8	10.28.0.1	00001010	00011100	00000000	00000001
Last IP 8	10.31.255.254	00001010	00011111	11111111	11111110
Broadcast IP 8	10.31.255.255	00001010	00011111	11111111	11111111

Net Add 9	10.32.0.0	00001010	00100000	00000000	00000000
First IP 9	10.32.0.1	00001010	00100000	00000000	00000001
Last IP 9	10.35.255.254	00001010	00100011	11111111	11111110
Broadcast IP 9	10.35.255.255	00001010	00100011	11111111	11111111

Net Add 10	10.34.0.0	00001010	00100100	00000000	00000000
First IP 10	10.34.0.1	00001010	00100100	00000000	00000001
Last IP 10	10.37.255.254	00001010	00100111	11111111	11111110
Broadcast IP 10	10.37.255.255	00001010	00100111	11111111	11111111

Net Add 11	10.38.0.0	00001010	00101000	00000000	00000000
First IP 11	10.38.0.1	00001010	00101000	00000000	00000001
Last IP 11	10.41.255.254	00001010	00101011	11111111	11111110
Broadcast IP 11	10.41.255.255	00001010	00101011	11111111	11111111

Bài 4: Chia mạng chứa địa chỉ IP: 192.168.22.31/19 thành 10 mạng con, mỗi mạng con chứa 500 host

Để biểu diễn 10 mạng con, ta cần ít nhất 4 bit (vì $2^4 = 16 > 10$)

$\Rightarrow$ Số bit còn lại: $13 - 4 = 9$

$\Rightarrow$ Số host: $2^9 - 2 = 510$

IP address	192.168.22.31	11000000	10101000	00010110	00011111
Subnet Mask	255.255.224.0	11111111	11111111	11100000	00000000
Network address	192.168.0.0	11000000	10101000	00000000	00000000
Subnet Mask new	255.255.254.0	11111111	11111111	11111110	00000000

Net Add 1	192.168.0.0	11000000	10101000	00000000	00000000
First IP 1	192.168.0.1	11000000	10101000	00000000	00000001
Last IP 1	192.168.1.254	11000000	10101000	00000001	11111110
Broadcast IP 1	192.168.1.255	11000000	10101000	00000001	11111111

Net Add 2	192.168.2.0	11000000	10101000	00000010	00000000
First IP 2	192.168.2.1	11000000	10101000	00000010	00000001
Last IP 2	192.168.3.254	11000000	10101000	00000011	11111110
Broadcast IP 2	192.168.3.255	11000000	10101000	00000011	11111111

Net Add 3	192.168.4.0	11000000	10101000	00000100	00000000
First IP 3	192.168.4.1	11000000	10101000	00000100	00000001
Last IP 3	192.168.5.254	11000000	10101000	00000101	11111110
Broadcast IP 3	192.168.5.255	11000000	10101000	00000101	11111111

Net Add 4	192.168.6.0	11000000	10101000	00000110	00000000
First IP 4	192.168.6.1	11000000	10101000	00000110	00000001
Last IP 4	192.168.7.254	11000000	10101000	00000111	11111110
Broadcast IP 4	192.168.7.255	11000000	10101000	00000111	11111111

Net Add 5	192.168.8.0	11000000	10101000	00001000	00000000
First IP 5	192.168.8.1	11000000	10101000	00001000	00000001
Last IP 5	192.168.9.254	11000000	10101000	00001001	11111110
Broadcast IP 5	192.168.9.255	11000000	10101000	00001001	11111111

Net Add 6	192.168.10.0	11000000	10101000	00001010	00000000
First IP 6	192.168.10.1	11000000	10101000	00001010	00000001

Last IP 6	192.168.11.254	11000000	10101000	00001011	11111110
Broadcast IP 6	192.168.11.255	11000000	10101000	00001011	11111111

Net Add 7	**192.168.12.0**	**11000000**	**10101000**	**00001100**	**00000000**
First IP 7	192.168.12.1	11000000	10101000	00001100	00000001
Last IP 7	192.168.13.254	11000000	10101000	00001101	11111110
Broadcast IP 7	192.168.13.255	11000000	10101000	00001101	11111111

Net Add 8	**192.168.14.0**	**11000000**	**10101000**	**00001110**	**00000000**
First IP 8	192.168.14.1	11000000	10101000	00001110	00000001
Last IP 8	192.168.15.254	11000000	10101000	00001111	11111110
Broadcast IP 8	192.168.15.255	11000000	10101000	00001111	11111111

Net Add 9	**192.168.16.0**	**11000000**	**10101000**	**00010000**	**00000000**
First IP 9	192.168.16.1	11000000	10101000	00010000	00000001
Last IP 9	192.168.17.254	11000000	10101000	00010001	11111110
Broadcast IP 9	192.168.17.255	11000000	10101000	00010001	11111111

Net Add 10	**192.168.18.0**	**11000000**	**10101000**	**00010010**	**00000000**
First IP 10	192.168.18.1	11000000	10101000	00010010	00000001
Last IP 10	192.168.19.254	11000000	10101000	00010011	11111110
Broadcast IP 10	192.168.19.255	11000000	10101000	00010011	11111111