Program:

```
import java.util.Scanner;
class Subnet
{
    public static void main(String args[])
    {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter the ip address: ");
        String ip = sc.nextLine();
        String split_ip[] = ip.split("\\.");
        String split_bip[] = new String[4];
        String bip = "";
        for(int i=0;i<4;i++)
        {
            split_bip[i] = appendZeros(Integer.toBinaryString(Integer.parseInt(split_ip[i])));
            bip += split_bip[i];
        }
        System.out.println("IP in binary is: "+bip);
        System.out.print("Enter the number of addresses per subnet: ");
        int n = sc.nextInt();
        int bits = (int)Math.ceil(Math.log(n)/Math.log(2));
        System.out.println("Number of bits required for address: = "+bits);
        int mask = 32-bits;
        System.out.println("The subnet mask is:" + mask );
        System.out.print("The subnet mask is:");
        for (int i=0;i<32;i++)
        {
            if(i<mask)
                System.out.print("1");
            else
                System.out.print("0");
    if((i+1)%8==0 && i!=31)
    {
        System.out.print(".");
    }
}
System.out.println();
int fbip[] = new int[32];
for(int i=0; i<32;i++)
    fbip[i] = (int)bip.charAt(i)-48;
for(int i=31;i>31-bits;i--)
    fbip[i] &= 0;
String fip[] ={"","","",""};
for(int i=0;i<32;i++)
    fip[i/8] = new String(fip[i/8]+fbip[i]);
System.out.print("Subnet address is = ");
for(int i=0;i<4;i++)
{
    System.out.print(Integer.parseInt(fip[i],2));
    if(i!=3)
        System.out.print(".");
}
int lbip[] = new int[32];
for(int i=0; i<32;i++)
    lbip[i] = (int)bip.charAt(i)-48;

for(int i=31;i>31-bits;i--)
    lbip[i] |= 1;
String lip[] = {"","","",""};
for(int i=0;i<32;i++)
    lip[i/8] = new String(lip[i/8]+lbip[i]);
System.out.println();
```

```
        System.out.print("Broadcast address is = ");

        for(int i=0;i<4;i++)
        {
            System.out.print(Integer.parseInt(lip[i],2));
            if(i!=3) System.out.print(".");
        }
        System.out.println();
        sc.close();
    }
    static String appendZeros(String s)
    {
        String temp = new String("00000000");
        return temp.substring(s.length())+ s;
    }
}
```

****

Output:

```
Enter the ip address: 192.168.2.0

IP in binary is: 11000000101010000000001000000000

Enter the number of addresses per subnet: 3

Number of bits required for address: = 2

The subnet mask is:30

The subnet mask is:11111111.11111111.11111111.11111100

Subnet address is = 192.168.2.0

Broadcast address is = 192.168.2.3
```

****

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F18111051 TE Comp 1

Assignment 4

Q1 Explain the difference between IPV4 and IP V6.

Ans

IPV 4	IPV 6
1 32 bit IP address	1 128 bit IP address
2 Numeric Addressing	2 Alphanumeric Addressing
3 Bits separated by dot (.)	3 Bits separated by colon (:)
4 12 header fields	4 8 header fields.
5 supports broadcast	5 Doese not support broadcast
6 Uses ARP	6 Uses NDP
7 Security depends on app	7 In built security.

Q2 Explain Header of IPV 4 with diagram

Ans

<table>
<tr><td>Version (4 bits)</td><td>HLEN (4 bits)</td><td>Type of service (8 bits)</td><td colspan="4">Total Length (16 bits)</td><td>32 bits- 4 bytes</td><td rowspan="5">20 bytes</td></tr>
<tr><td colspan="3">Identification (16 bits)</td><td>0 (1 bits)</td><td>DF (1 bits)</td><td>DF (1 bit)</td><td>Fragment offset</td><td>4 bytes</td></tr>
<tr><td colspan="2">Time to leave (8 bits)</td><td>Protocol (8 bits)</td><td colspan="4">Header Checksum (16 bits)</td><td>4 bytes</td></tr>
<tr><td colspan="7">Source IP (32 bits)</td><td>4 bytes</td></tr>
<tr><td colspan="7">Destination IP (32 bits)</td><td>4 bytes</td></tr>
<tr><td colspan="7">Option (0 to 40 bytes)</td><td></td><td></td></tr>
<tr><td colspan="7">DATA</td><td></td><td></td></tr>
</table>

32 bits

<u>Version</u>: Version of the IP protocol (4 bits) which is 4 for IPV 4

<u>HLEN</u>: IP header lengths (4 bits) which is the number of 32 bits words in the header.

Type of service: Low delay, High throughput, Reliability.

Total Length: Length of header + Data (16 bits)

Identification: Unique packet id or identifying the group of fragments of a single IP datagram.

Flags: 3 flags of 1 bit each: reserve flag, do not fragment flag and more fragment flag.

Fragment offset: Represents the number of Data Bytes ahead of a particular fragment in the particular datagram.

Time to live: It prevents the datagram to loop through the network by restricting number of HOPs.

Protocol: Name of the protocol to which the data is to be passed.

Header Checksum: For checking errors.

Q3 Explain classes of IP address

Ans Class A: 1st bit of 1st octet is 0 : Range 1-127
8 network bits 24 - ~~Host~~ Host bits.

Class B: First 2bit of 1st octet is 10: range 128 - 191
16 network bits 16 host bits

Class C: First 3 bit of 1st octet is 110: range 192 - 223
24 network bits 8 host bits

Class D: First 4 bits of 1st octet is 1110: range 224 - 239
Reserved for multi tasking.

Class E: Reserved for experimental purpose