Homework 8, Due Date*: 10:00am 04/16/2015, Cutoff Date: 10:00am 04/19/2015**

Submission: Hardcopy at the beginning of the class. (Email to wzhu1@msudenver.edu can be used for late submission)

***Late penalty will apply for past-due late submission; ****Submission will NOT be accepted after the cutoff deadline**

Problem A. Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in these subnets are required to have the prefix 134.39.176.0/22. Also suppose that Subnet 1 needs to support at least 450 interfaces, Subnet 2 needs to support at least 200 interfaces, and Subnet 3 needs to support at least 160 interfaces. Provide three network addresses (a.b.c.d/x) that satisfy these constraints.

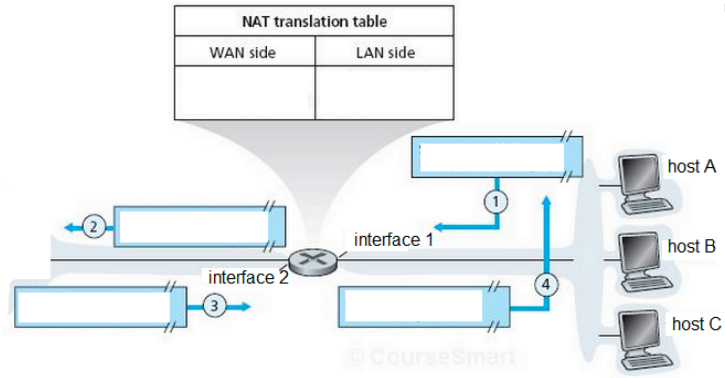
Problem B. Rewrite the following forwarding table using the a.b.c.d/x notation:

Prefix Match	Link Interface
11100000 00****** ******** ********	0
11100000 01000000 ******** ********	1
1110000* ******** ******** ********	2
11100001 1******* ******** ********	3

Problem C. Consider the network setup in the following figure, where the router is a NATed router. Suppose that the ISP assigns the router the address 192.162.30.79 and that the network address of the home network is 172.20.0.0/16.

a. Assign addresses to interfaces 1 and 2, and hosts A, B and C.

b. Suppose host B has an ongoing TCP connection to port 4567 at server 34.182.19.20 from port 80 at host B. The NATed router assigns a new port 8080 for this TCP connection. Provide the corresponding entry in the NAT translation table and the source ip, source port, destination ip, and destination port in each of the four IP datagrams shown below.



Problem D. Below is the information displayed by a command "tracert www.google.com" on the host at 192.168.1.102.

```
Tracing route to www.google.com [74.125.141.104]
over a maximum of 30 hops:

  1     1 ms    <1 ms    <1 ms  192.168.1.1
  2    21 ms    15 ms    19 ms  c-174-51-20-1.hsd1.co.comcast.net [174.51.20.1]
  3    11 ms    12 ms    12 ms  te-9-5-ur01.englewood.co.denver.comcast.net [68.85.221.245]
  4    54 ms    13 ms    15 ms  te-0-0-0-6-ar02.denver.co.denver.comcast.net [68.86.179.166]
  5    14 ms    13 ms    17 ms  pos-0-1-0-0-ar02.aurora.co.denver.comcast.net [68.86.128.242]
  6    14 ms    14 ms    18 ms  he-3-10-0-0-cr01.denver.co.ibone.comcast.net [68.86.92.25]
  7    13 ms    12 ms    69 ms  xe-5-0-1-0-pe01.910fifteenth.co.ibone.comcast.net [68.86.82.198]
  8    14 ms    14 ms    13 ms  173.167.57.206
  9    17 ms    14 ms    15 ms  72.14.234.59
 10    14 ms    14 ms    12 ms  216.239.46.146
 11    39 ms    40 ms    39 ms  216.239.46.159
 12    46 ms    49 ms    47 ms  216.239.46.200
 13    48 ms    46 ms    46 ms  64.233.174.125
 14     *        *        *     Request timed out.
 15    48 ms    79 ms    46 ms  da-in-f104.1e100.net [74.125.141.104]

Trace complete.
```

a. How many routers are involved in the communication between the host 192.168.1.102 and the web server www.google.com?

b. What is the initial TTL and the destination ip enclosed by the host in the set of IP datagrams that are dropped by the router 72.14.234.59?

c. When the router 68.86.128.242 drops an ip datagram enclosing a UDP segment from the host 192.168.1.102, does it send a UDP segment or an ICMP message to the host? What are the type, code, name of router, and IP address of router enclosed in such UDP segment or ICMP message?

d. What is the final TTL and the destination ip enclosed in the set of IP datagrams that arrive at the web server www.google.com? Does this webserver send a UDP segment or an ICMP message back to the host? What are the type and code enclosed in such UDP segment or ICMP message?

Problem E. Tunneling is used for the transition from IPv4 to IPv6. The route from Host A to Host B is shown as below, where ip1, ip2, … ip10 are the ip addresses of the hosts and the interfaces of routers. Host A sends a TCP segment to Host B. To deliver this TCP segment, for the IP datagram transmitted over EACH link, describe (1) the type of IP datagram (IPv4 or IPv6), (2) the source ip address, and (3) the destination ip address.