Assignment 4

Assignments Instructions:

1- Please briefly justify/explain your approach and/or answers.
2- In addition to your approach, please calculate the final answer when applicable.
3- Use the coversheet provided in the course page.
4- If you decide to team up with another student in an assignment, please recall that you are NOT allowed to team up with one student more than once in this course for all assignments (no matter if required or optional) .
5- **Submit through MarkUs.**

Problem 1: Sort-answer Questions

a) Suppose Host A sends Host B a TCP segment encapsulated in an IP datagram. When Host B receives the datagram, how does the network layer in Host B know it should pass the segment (that is, the payload of the datagram) to TCP rather than to UDP or to something else?

b) The netmask for a subnet is 255.255.255.248, what's the maximum number of hosts can be in this subnet?

c) The hexadecimal code for an IP address is C2.2F.14.81. Determine which class this IP belongs to, in a classful network.

d) Consider a virtual-circuit network. Suppose the VC number is an 8-bit field. What is the maximum number of virtual circuits that can be carried over a link?

e) In part (d), suppose a central node determines paths and VC numbers at connection setup. Suppose the same VC number is used on each link along the VC's path. Describe how the central node might determine the VC number at connection setup. Is it possible that there are fewer VCs in progress than the maximum as determined in part (a) yet there is no common free VC number?

Problem 2: Routing Table

A routing table in a router is as following:

Destination	netmask	next hop
128.96.39.0	255.255.255.128	port0
128.96.39.128	255.255.255.128	port1
128.96.40.0	255.255.255.128	R2
192.4.153.0	255.255.255.192	R3
default		R4

Compute the next hop for each of the following packets:

a) 128.96.39.10

b) 128.96.40.12

c) 128.96.40.151

d) 192.4.153.17

e) 192.4.153.90

Problem 3: Network Address Translation

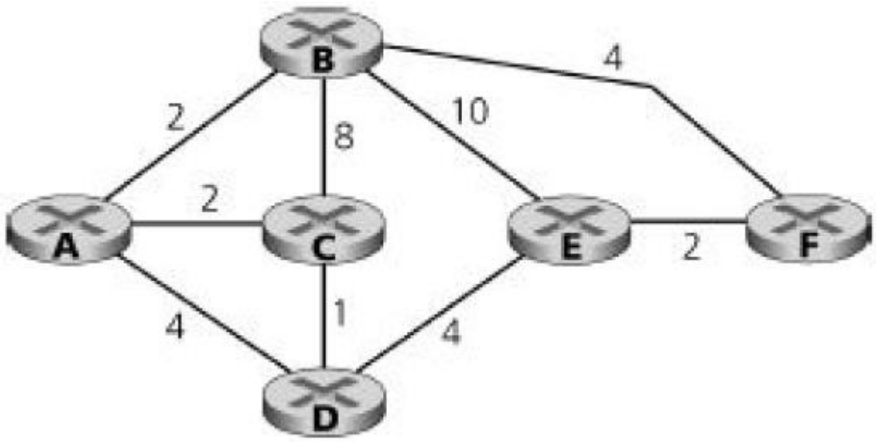
P2P applications need peers to be able to directly connect to each other. Consider a file sharing application that users connect to a central server that keeps track of which users have which files. Assume that Alice wants to download a file, and the server tells her that Bob has it.

a) What problem will Alice face if both of them (Alice and Bob) are behind NAT?

b) Provide a solution so that Alice can create a TCP connection to Bob.

Problem 4: Link-State Routing Algorithm

Consider the network shown below. Show the operation of Dijkstra's (link-state) algorithm for computing the least cost path from B to all destinations. What is the shortest path from B to D, and what is the cost of this path?



Problem 5: Distance Vector Routing Algorithm

Consider the network shown above in Problem 4.

a) What are A, B, C, D, E, and F's distance vectors? Note: you do not have to run the distance vector algorithm; you should be able to compute distance vectors by inspection. Recall that a nodes distance vector is the vector of the least cost paths from itself to each of the other nodes in the network.

b) Now consider node C. From which other nodes does C receive distance vectors?

c) Consider node C again. Through which neighbor will C route its packets destined to E? Explain how you arrived at your answer, given the distance vectors that C has received from its neighbors.

d) Consider node E. From which other nodes does E receive distance vectors?

e) Consider node E again. Through which neighbor will E route its packets destined to B. Explain how you arrived at your answer, given the distance vectors that E has received from its neighbors.