CS 164 COMPUTER NETWORKS
Assignment 5 -- Answers

- Read chapter 4 till the end of 4.3. Read also Chapter 5.1 and 5.2.
- Answer the following questions (three from your textbook and one from the lecture notes). Make sure your calculations are organized; provide explanations where needed.
- Breakdown of points:
  - 30% for the 1st question (6% each part),
  - 20% for the 2nd question (10% each part),
  - 25% for the 3rd question,
  - 25% for the 4th question.

1. Exercise #21 on p. 360

Apply each subnet mask and if the corresponding subnet number matches the SubnetNumber column, then use the entry in Next-Hop. (In these tables there is always a unique match.)
(a) Applying the subnet mask 255.255.255.128, we get 128.96.39.0. Use interface0 as the next hop.
(b) Applying subnet mask 255.255.255.128, we get 128.96.40.0. Use R2 as the next hop.
(c) All subnet masks give 128.96.40.128 as the subnet number. Since there is no match, use the default entry. Next hop is R4.
(d) Next hop is R3.
(e) None of the subnet number entries match, hence use default router R4.

2. Exercise #40 on p. 366

(a) Giving each department a single subnet, the nominal subnet sizes are 27, 26, 25, 25 respectively; we obtain these by rounding up to the nearest power of 2. A possible arrangement of subnet numbers is as follows. Subnet numbers are in binary and represent an initial segment of the bits of the last byte of the IP address; anything to the right of the "/" represents host bits. The "/" thus represents the subnet mask. Any individual bit can, by symmetry, be flipped throughout; there are thus several possible bit assignments.

A 0/ (one subnet bit, with value 0; seven host bits)
B 10/
C 110/
D 111/

The essential requirement is that any two distinct subnet numbers remain distinct when the longer one is truncated to the length of the shorter.

(b) We have two choices: either assign multiple subnets to single departments, or abandon subnets and buy a bridge. Here is a solution giving A two subnets, of sizes 64 and 32; every other department gets a single subnet of size the next highest power of 2:

A 01/
001/
B 10/
C 000/
D 11/

3. Exercise #41 on p. 366

To solve this with subnets, C has to be given its own subnet. Even if this is small, this reduces the available size of the original Ethernet to at most seven bits of subnet address. Here is a possible routing table for B; subnet numbers and masks are in binary. Note that many addresses match neither subnet.

net	subnet	mask	interface
200.0.0	0/000 0000	1000 0000	Ethernet
200.0.0	1000 00/00	1111 1100	direct link

Here C's subnet has been made as small as possible; only two host bits are available (a single host bit can't be used because all-zero-bits and all-ones-bits are reserved in the host portion of an address). C's address might now be 200.0.0.10000001, with the last octet again in binary.

4. Explain the triangle routing problem with Mobile IP, and discuss what is done to overcome the problem.

See Chapter 4.2.5, p.298 for a thorough explanation.