Solutions to Homework#3

4: Consider the first network: packets have room for 1024-20 = 1004 bytes of IP-level data: because 1004 is not a multiple of 8 each fragment can contain at most 8*floor(1004/8) = 1000 bytes. We need to transfer 2048+20 = 2068 bytes of such data. This would be fragmented into fragments of size 1000, 1000, and 68.

The same analysis can be applied to the second network.

(Note: the textbook gives the wrong solution to Ex. 5.)

15. (a)

Information Stored at Node	Distance to Reach Node					
	A	B	C	D	E	F
A	0	∞	3	8	∞	∞
B	∞	0	∞	∞	2	∞
C	3	∞	0	∞	1	6
D	8	∞	∞	0	2	∞
E	∞	2	1	2	0	∞
F	∞	∞	6	∞	∞	0

(b)

Information Stored at Node	Distance to Reach Node					
	A	B	C	D	E	F
A	0	∞	3	8	4	9
B	∞	0	3	4	2	∞
C	3	3	0	3	1	6
D	8	4	3	0	2	∞
E	4	2	1	2	0	7
F	9	∞	6	∞	7	0

(c)

Information Stored at Node	Distance to Reach Node					
	A	B	C	D	E	F
A	0	6	3	6	4	9
B	6	0	3	4	2	9
C	3	3	0	3	1	6
D	6	4	3	0	2	9
E	4	2	1	2	0	7
F	9	9	6	9	7	0

17\.

D	Confirmed	Tentative
1.	(D,0,-)	
2.	(D,0,-)	(A,8,A)
		(E,2,E)
3.	(D,0,-)	(A,8,A)
	(E,2,E)	(B,4,E)
		(C,3,E)
4.	(D,0,-)	(A,6,E)
	(E,2,E)	(B,4,E)
	(C,3,E)	(F,9,E)
5.	(D,0,-)	(A,6,E)
	(E,2,E)	(F,9,E)
	(C,3,E)	
	(B,4,E)	
6.	previous + (A,6,E)	
7.	previous + (F,9,E)	

21\. 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.

40. (a) Giving each department a single subnet, the nominal subnet sizes are 2^7, 2^6, 2^5, 2^5 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/

45. (a): B (b): A (c): E (d): F (e): C (f): D
(For the last one, note that the first 14 bits of C4.6B and C4.68 match.)

60. (a) One multicast transmission involves all $k + k^2 + ... + k^{N-1} = (k^N - k)/(k-1)$ links

(b) One unicast retransmission involves N links; sending to everyone would require $N \times k^N$ links.