Problem 7

Number of needed subnets = 2000
Number of usable hosts = 15
Network address = 178.100.0.0

Address class = B
Default subnet mask = 255.255.0.0
Custom subnet mask = 255.255.205.224
Total number of subnets = 2048
Total number of host addresses = 32
Number of usable host addresses = 30
Number of bits borrowed = 11

Hosts	65536	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2

. 256 128 64 | 32 16 8 4

Subnets	2	4	8	16	32	64	128	256
Binary	128	64	32	16	8	4	2	1 · 128 64 32 16 8 4 2

178.100.O : O O O O O O O O · O O O O O O

⌐ Bits borrowed = 11

128 + 64 + 32 + 16 + 8 + 4 + 2 + 1 = 255
128 + 64 + 32 = 224   — custom subnet
32 - 2 = 30   — host addresses usable

Problem 11

Number of needed usable hosts = 8,000

Network address = 135.70.0.0

Address class = B

Default subnet mask = 255.255.~~255~~.0 ⁰

Custom subnet mask = 255.255.224.0

Total number of subnets = 8

Total ~~hosts~~ number of host addresses = 8192

Number of usable addresses = 8190

Number of bits borrowed = 3

~~135.70.1~~6⁶0→135.70.191.25~~5~~ ~~135.70.192.0→135.70.223.2~~

6th subnet range = ~~████████~~

7th subnet number = 135.70.192.0

Subnet broadcast address for the 3rd subnet =

~~(135.70.127.255)~~ 135.70.95.255

Assignable address for 5th subnet =

135.70.128 → 135.70.159.255

Hosts 65536 32768 16384 8192 4096 2048 1024 512 256 128 64 32 16 8 4 2

Subnets 2 4 8 16 32 64 128 256

Binary 128 64 32 16 8 4 2 1 . 128 64 32 16 8 4 2 1
= 224

135.70.0 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0 0
  ↑Borrow↑

(0) 0 0 0   135.70.0.0   to   135.70.31.255
(1) 0 0 1   135.70.32   to   135.70.63.255
(2) 0 1 0   135.70.64   to   135.70.95.255
(3) 0 1 1   135.70.96   to   135.70.127.255
(4) 1 0 0   135.70.128   to   135.70.159.255
(5) 1 0 1   135.70.1~~6~~0   to   ~~135.70.1~~ 135.70.159.255

(6) 110	135.70.192.0 → 135.70.~~192~~.223
(7) 111	135.70.224.0 → 135.70.255

Problem 15

Number of needed usable hosts = 50
Network address = 172.59.0.0

Address class = B
Default subnet mask = 255.255.2̶5̶5̶.
Custom subnet mask = 2.55.255.255.192
Total number of subnets = 1024
Total number of host addresses = 64
Total number of usable addresses = 62
Number of bits borrowed = 10

Because we need 50 hosts

Hosts→ 0.0.0.0 32.768 16.384 8.192 4.096 2.048 1.024 512 256 128 64 32 16 8 4 2

. 256 128 64 32 16 8 4 2
512 1024 2048 4096 8192

Subnets 2 4 8 16 32 64 128 256

Binary 128 64 32 16 8 4 2 1 . 128 64 32 16 8 4 21

172.59. 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 000
←— no. of bits borrowed —>

128 + 64 + 32 + 16 + 8 + 4 + 2 + 1 = 255
128 + 64 = 192

Problem 12

Needed usable hosts = 45
Network address = 198.125.50.0

Address class = C
Default subnet mask = 255.255.255.0
Custom subnet mask = 255.255.255.192
Total number subnets = 4
Total number host addresses = 64
Total usable addresses = (64-2) = 62
Total bits borrowed = 2

198.120.50.64 → 198.125.50.127
2nd subnet range: 198.125.00.64 → 198.125.50.63
2nd subnet number: 198.125.50.64 ~~01001101011011~~
4th subnet broadcast address: 198.125.50.255
3rd subnet assignable addresses: 198.125.50.19

256	128	64	32	16	8	4	2	- no. hosts
2	4	8	16	32	64	128	256	- no subnets
128	64	32	16	8	4	2	1	- binary
198.125.50 0	0	0	0	0	0	0	0	

Bits
borrowed

end of
subnetmask

128 + 64 = 192

(0) 000 | 198 . 125 . 50 . 0 -> 198 . 125 . 50 . 63
(01) 01 | 198 . 125 . 50 . 64 -> 198 . 125 . 50 . 127
(2) 10 | 198 . 125 . 50 . 128 -> 198 . 125 . $\overset{50}{\approx}$ 191
(3) 11 | 198 . 125 . 50 . 192 -> 198 . 125 . 50 .
255