Q8

(a) for the first range, same part is 1110 0000, 00xx xxxx, ...

224.0.0.0/10

for the second range, same part is 1110 0000, 0100 0000, ...

224, 64, 0, 0/16

for the third range, same part is 11100000, xx ...

224.0.0.0/7

tail of third range 1110 0001 0111 1111 include

1110 0001 1000 no include.

the tail is 1110 0001 . 1111 1111 . 1111 1111 . 1111 1111

same part

1110 0001 1

225.128.0.0/9

Destination address	interface
224.0.0.0/10	0
224.64.0.0/16	1
224.0.0.0/7	2
225.128.0.0/9	3
Otherwise	3

Destination address	interface
11100000 . 00	0
11100000 . 0100 0000	1
1110 0000 .	2
1110 0001 . 1	3
Otherwise	3

(b) 200.145.81.87 & 255.192.0.0 = 200.128.0.0
& 255.255.0.0 = 200.145.0.0
& 254.0.0.0 = 200.0.0.0 → match
& 255.128.0.0 = 200.128.0.0 → match → longest
go to interface 3

225.64.195.60 & 255.192.0.0 = 225.64.0.0
& 255.255.0.0 = 225.64.0.0 → match → longest
& 254.0.0.0 = 224.0.0.0 → match
& 255.128.0.0 = 224.0.0.0
go to interface 2

225.128.17.119 & 255.192.0.0 = 225.128.0.0

& 255.255.0.0 = 225.128.0.0

& 254.0.0.0 = 254.0.0.0 → match

& 225.128.0.0 = 225.128.0.0 → match → longest

go to interface 3

Q9

0 ~ 48		
64 ~ 95		1
96 ~ 127		2
128 ~ 191		2
192 ~ 255		3

⇓

0 ~ 48		$2^{8-2} = 2^6 = 64$
64 ~ 95	1	$2^{8-3} = 2^5 = 32$
96 ~ 191	2	$2^{8-3} + 2^{8-2} = 2^5 + 2^6 = 3 \times 2^5 = 3 \times 32 = 96$
192 ~ 255	3	$2^{8-2} = 2^6 = 64$

(0000 0000
0011 1111

(0100 0000
0101 1111

(0110 0000
0111 1110

(1000 0000
1011 1111

(1100 0000
1111 1111

Q10

~~128 ~ 255~~

128 ~ 191	1	$2^{8-2} = 64$
224 ~ 255	2	$2^{8-3} = 32$
0 ~ 127	3	$2^7 = 128$

1000 0000 ~ 1111 1111

1000 0000 ~ 1011 1111

1110 0000 ~ 1111 1111

0000 0000 ~ 0111 1111

+1

Q11

subnet 1

subnet 2

subnet 3

Subnet 1 : 60 $2^6 = 64$

Subnet 2 : 90 $2^7 = 128$

Subnet 3 : 12 $2^4 = 16$

total IP address = $2^{32-24} = 2^8 = 256$

subnet 1 : 223.1.17.128/26 — 10:00 0000 / 10:11 1111

subnet 2 : 223.1.17.0/25 — 0:00 0000 / 0:11 1111

subnet 3 : 223.1.17.192/28 — 11:00:0000 / 11:00:1111

Q12

Destination address	interface
200.23.16.0/21	0
200.23.24.0/24	1
200.23.24.0/21	2
otherwise	3

P13

Destination address	interface
224.0.0.0/10	0
224.64.0.0/16	1
256.0.0.0/7	2
225.128.0.0/9	3
Otherwise	3

P14 ① 128.119.40.128/26 has an IP address 128.119.40.129

② $2^2 = 4$ 2bits is required for dividing.

128.119.40.64/26

64 ⇒ 01:00 0000

0100 : 0000 — 128.119.40.64/28

0101 : 0000 — 128.119.40.80/28

0110 : 0000 — 128.119.40.96/28

0111 : 0000 — 128.119.40.112/28

P15

subnet A : 250 — $2^8 = 256$

subnet B : 120 — $2^7 = 128$

subnet C : 120 — $2^7 = 128$

subnet D : 2 — $2^1 = 2$

subnet E : 2 — $2^1 = 2$

subnet F : 2

total interface $2^{32-23} = 2^9 = 512$

needed interface $250+250+4 = 494$

254 ⇒ 1111 1110

subnet A : 214.97.254/24

B : 214.97.255.0/25 − 214.97.255.0/29

C : 214.97.255.128/25

D : 214.97.255.0/31

E : 214.97.255.2/31

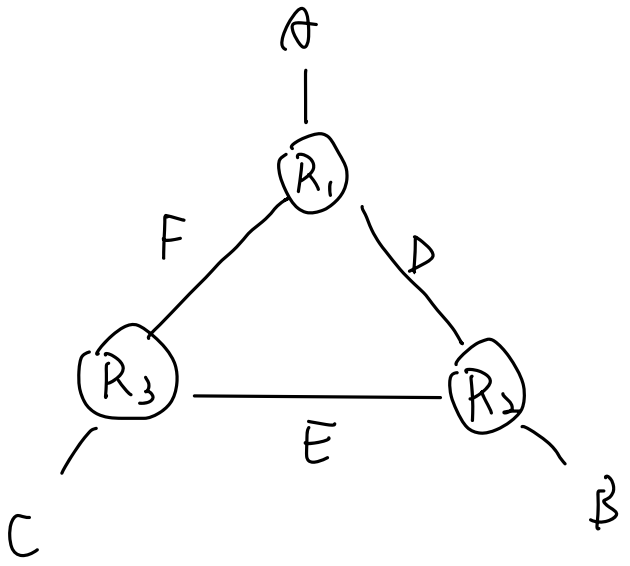
F : 214.97.255.4/31

0000 0000

0000 0010

0000 0100

(b)



for R_1

	interface
214.97.254/24	subnet A
214.97.255.4/31	F
214.97.255.0/31	D

for R_2

	interface
214.97.255.0/25	subnet B
214.97.255.0/31	D
214.97.255.2/31	E

for R_3

	interface
214.97.255.128/25	subnet C
214.97.255.4/31	F
214.97.255.2/31	E

C₅ P₃

step	SPT	y	z	w	v	u	t
		D(y), p(y)	D(z), p(z)	D(w), p(w)	D(v), p(v)	D(u), p(u)	D(t) p(t)
0	x	6, x	8, x	6, x	3, x	∞	∞
1	xv	6, x	8, x	6, x		6, v	7, v
2	xvy		8, x	6, x		6, v	7, v
3	xvyw		8, x			6, v	7, v
4	xvywu		8, x				7, v
5	xvywut		8, x				
6	xvywutz						

x→y : 6
x→z : 8
x→w : 6
x→v : 3
x→u : 6
x→t : 7

C₆ P₅

	x	y	z	u	v
z	2	∞	0	∞	6
x	0	3	2	∞	3
v	3	∞	6	1	0

↓

	x	y	z	u	v
z	2	5	0	∞	5
x	0	3	2	∞	3
v	3	6	5	1	0

2 ∞ 0 ∞ 6
2 5 4 ∞ 5

3 ∞ 6 1 0
3 6 5 ∞ 6

z get vector from x
v get vector from x

2 5 0 ∞ 5
8 11 10 6 5

	x	y	z	u	v
z	2	5	0	6	5
x	0	3	2	4	3
v	3	6	5	1	0

z get vector from v

x get vector from x

0	3	2	00	3
6	9	8	4	3

	x	y	z	u	v
z	2	5	0	6	5
x	0	3	2	4	3
v	3	6	5	1	0

x get vector from z

v get vector from z

0	3	2	4	3
4	7	2	8	7

3	6	5	1	0
8	11	10	6	0