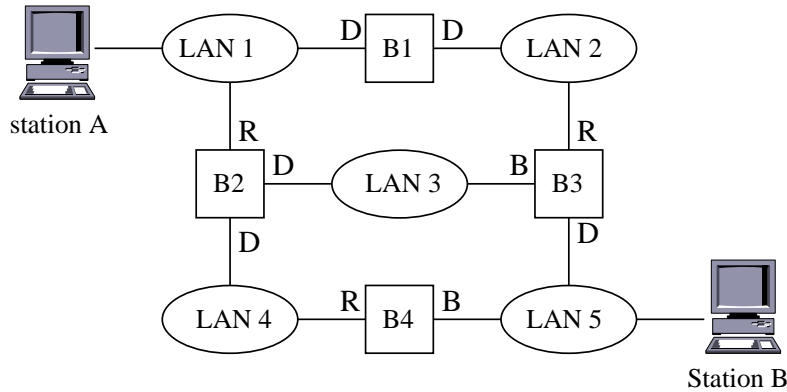


# Sample Final Examination Answers

1.  $x_1 = x_5 = x_9 = A$ ;  
 $x_2 = 7$ ;  $x_3 = x_7 = x_{11} = 5$ ;  $x_4 = x_8 = 0$ ;  
 $x_6 = 0$ ;  $x_{10} = 1$ ;  $x_{12} = 1$ ;  $x_{13} = B$ ;  $x_{14} = 1$ ;  
 $y_1 = 2$ ;  $y_2 = 0$ ;  $y_3 = 2$ .

2. (a) R-root port; D-Designated port; B-Blocked port.



- (b) MAC tables:

B1		B2		B3		B4	
A	1	A	1	A	1	A	1
B	2	B	1	B	3		

3. (a) Routing tables:

SW1 routing table				SW2 routing table				SW3 routing table			
Incoming Node	VCI	Outgoing Node	VCI	Incoming Node	VCI	Outgoing Node	VCI	Incoming Node	VCI	Outgoing Node	VCI
A	0	SW2	0	SW1	0	D	0	SW2	0	E	0
B	0	SW2	1	SW1	1	SW3	0	SW2	1	F	0
C	0	SW2	2	SW1	2	SW3	1	E	0	SW2	0
SW2	0	A	0	D	0	SW1	0	F	0	SW2	1
SW2	1	B	0	SW3	0	SW1	1				
SW2	2	C	0	SW3	1	SW1	2				

- (b) Time to transmit a packet ( $t_p$ ) =  $7.2 \times 10^{-4}$ ;  
 Propagation time over 1 km link ( $t_1$ ) =  $5 \times 10^{-6}$ ;  
 Propagation time over 1000 km link ( $t_{1000}$ ) =  $5 \times 10^{-3}$ .  
 Therefore, delay =  $3 \times t_p + 2 \times t_1 + t_{1000} = 7.17$  msec.

4. (a) One possible design:

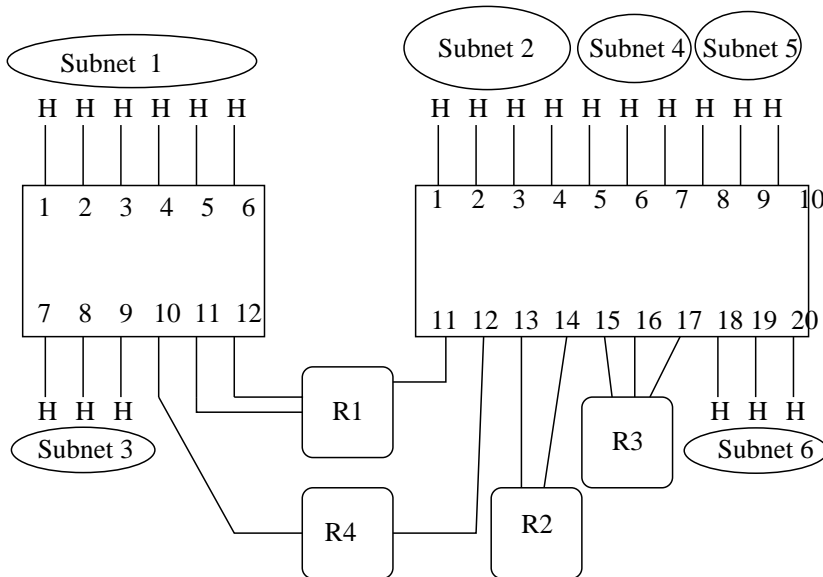
Subnet 1: 210.128.128.0/26  
 Subnet 2: 210.128.128.64/26  
 Subnet 3: 210.128.128.128/27  
 Subnet 4: 210.128.128.160/27  
 Subnet 5: 210.128.128.192/27  
 Subnet 6: 210.128.128.224/27

(b) Routing table content:

Network ID	Interface	Next Hop
Subnet 1	e0	DC
Subnet 2	e1	DC
Subnet 3	e2	DC
Subnet 4	e1	R2
Subnet 5	e1	R3
Subnet 6	e1	R3
	e2	R4

- R2's IP address = 210.128.128.65
- R3's IP address = 210.128.128.66
- R4's IP address = 210.128.128.129

(c) Physical topology:



VLAN assignment (assume VLAN n is configured for Subnet n, where n = 1,...,6):

**Switch 1:**

- Ports 1-6, 11 → VLAN 1;
- Ports 7-9, 10, 12 → VLAN 3.

**Switch 2:**

- Ports 1-4, 11, 13, 15 → VLAN 2;
- Ports 5-7, 14 → VLAN 4;
- Ports 8-10, 16 → VLAN 5;
- Ports 18-20, 17, 12 → VLAN 6.

5. **135.95.05.166:**

Based on the routing table of the host, the destination is directly connected. Therefore, the frames sent by the host are:

DA	SA	type		
Oxffffffffffff	MAC(135.95.5.132)	Ox0806	Payload	FCS

DA	SA	type		
MAC(135.95.5.166)	MAC(135.95.5.132)	Ox0800	Payload	FCS

Dest./Source IP addresses: 135.95.5.166/135.95.5.132

**150.10.10.180:**

Host sent the following two frames:

DA	SA	type		
Oxffffffffffff	MAC(135.95.5.132)	Ox0806	Payload	FCS

DA	SA	type		
MAC(135.95.5.129)	MAC(135.95.5.132)	Ox0800	Payload	FCS

Dest./Source IP addresses: 150.10.10.180/135.95.5.132

The default router sent the following frames:

DA	SA	type		
Oxffffffffffff	MAC(135.95.5.129)	Ox0806	Payload	FCS

DA	SA	type		
MAC(135.95.5.65)	MAC(135.95.5.129)	Ox0800	Payload	FCS

Dest./source IP addresses: 150.10.10.180/135.95.5.132

6. (a) The worst case is each "read" system call can only read 1 byte. Therefore, the maximum number of "read" system calls needed to be invoked is 100.

(b) **Server program:**

```
.
char EOF= '0xff';
.
.
.
while((n=read(fd, buf, BUFLen)) > 0){
    write(sd, buf,n);
}
write(sd, &EOF, 1);
```

**Client program:**

```

Char EOF='0xff';
.
.
.
test = 0;
while(1){
    n = read(sd, buf, BUFLen);
    for(i=0; i<n; i++){
        if(buf[i] == EOF){
            test=1;
            num = i;
            break;
        }
    }
    write(fd, buf, num);
    if(test==1) break;
}

```

- (c) A non-ASCII file could contain byte(s) with the value of '0xff', and this data byte would be treated mistakenly as the end-of-file byte.