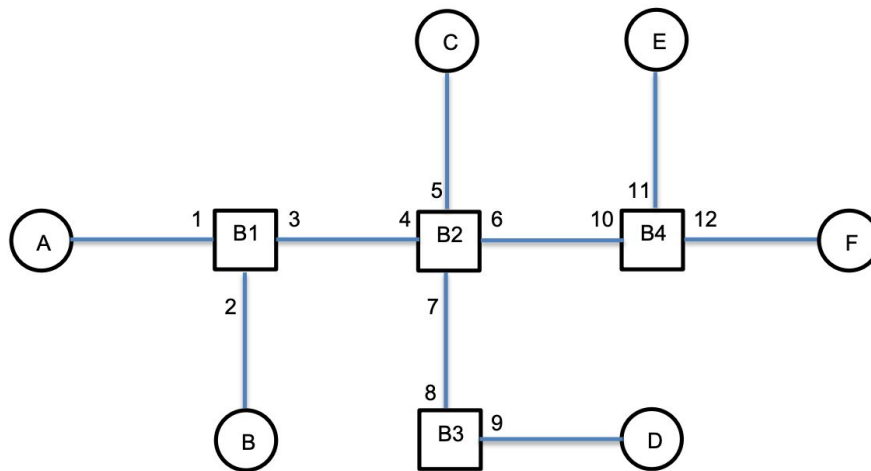


1. Bridging (21 pts)

1.1 Selective forwarding & forwarding table (10 pts)



1.1.1 Assume the forwarding table at each bridge is empty initially. They are all learning bridges; the tables will populate automatically as we progress through each part of this question. Please list the set of bridges that will receive each of the following frames. (5 pts)

1.1.1.a. Host A sends a frame to Host F

B1, B2, B3, B4

1.1.1.b. Host C sends a frame to Host D

B1, B2, B3, B4

1.1.1.c. Host D sends a frame to Host F

B1, B2, B3, B4

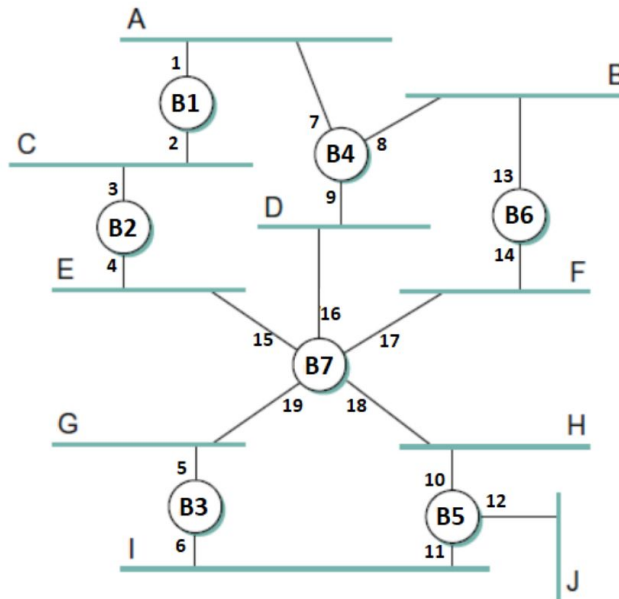
1.1.1.d. Host C sends a frame to Host D

B2, B3

1.1.2 Write out the forwarding table at bridge B2 after the previous 4 frames (5 pts)

Host	Port
A	4
C	5
D	7

1.2 Spanning Tree (11 pts)



1.2.1 (6 pts) As described in the lecture, each bridge will send out a configuration message in the format (RootId, Distance, MyId). After the network has stabilized,

1.2.1.a What configuration will B6 send out?

B6: (B1, 2, B6)

1.2.1.b What configuration will B7 send out?

B7: (B1, 2, B7)

1.2.1.c What configuration will B5 send out?

B5: (B1, 3, B5)

1.2.2 Which ports will be deactivated? (2 pts)

11, 16 and 17

1.2.3 Assume the root bridge suddenly fails, and the network reconverges.

1.2.3.a Who would be the new root? (1.5 pt)

B2, the one with the next-smallest id

1.2.3.b Will any port(s) be deactivated in the new tree? If so, which ones? (1.5 pt)

Port (1,2) 11, 13, 14

2. IP Packet Fragmentation (10 pts)

Our router receives an IP packet. Part of the header of this packet is as follows:

Length	ID	MF	DF	OFFSET	TTL
600	31	0	0	0	100

Now the router has to fragment this packet and forward the fragments across a network with an MTU of 260 bytes. (MTU refers to the size of the largest packet that can be carried in a link-layer frame) Assume the size of the IP header is 20 bytes.

2.1 Number of fragments needed? (2 pts)

3

2.2 Write out the details of fragments in the same format as provided in 2.1. (6 pts)

Length	ID	MF	DF	OFFSET	TTL
260	31	1	0	0	99

Length	ID	MF	DF	OFFSET	TTL
260	31	1	0	30	99

Length	ID	MF	DF	OFFSET	TTL
120	31	0	0	60	99

2.3 What will get retransmitted if the last fragment is lost? Who will retransmit it? (2 pts)

The original packet will be retransmitted by the source, and the router will once again need to fragment it.

3. IPv4 & IPv6 (13 pts)

3.1 Given IPv4 addresses, determine the class of network to which it belongs. (3 pts)

3.1.1 192.168.213.214

class C

3.1.2 124.24.99.14

class A

3.1.3 130.21.24.122

class B

3.2 Given IP address 198.124.1.3, what should the network mask be if I want to subnet to 8 different subnets? Write out the mask in hexadecimal form. (5 pts)

198.124.1.3 is class C, so the netmask for the network is 11111111.11111111.11111111.0; the last byte is the host portion. In order to partition the host part into a subnet identifier and host we need 3 bits.

So the subnet mask would be 11111111.11111111.11111111.11100000
In hexadecimal form: FF.FF.FF.E0, or, in a dotted quad, 255.255.255.224.

3.3 Make F9F9:0011:0000:0000:BBB0:0009:0000:9000 as succinct as possible (2 pts)

F9F9:11::BBB0:9:0:9000

3.4 Determine if the following IPv6 addresses are valid, circle your choice (3 pts)

3378:4581:8::DADA::2131

Valid

Not Valid

39::1

Valid

Not Valid

105:0:0:0::01

Valid

Not Valid

4. CIDR + Longest Prefix Matching (6 pts)

Given the forwarding table for router R as follows

Destination	Next Hop
127.0.0.1	loopback
128.96.39.0/24	Interface 1
128.96.38.0/23	Interface 2
128.17.0.0/16	Interface 3
113.89.79.0/24	Interface 4
<default>	128.17.0.1

What will be the next hop of an incoming packet with the destination as

4.1 128.96.38.7 (2 pts)

Interface 2

4.2 128.17.38.132 (2 pts)

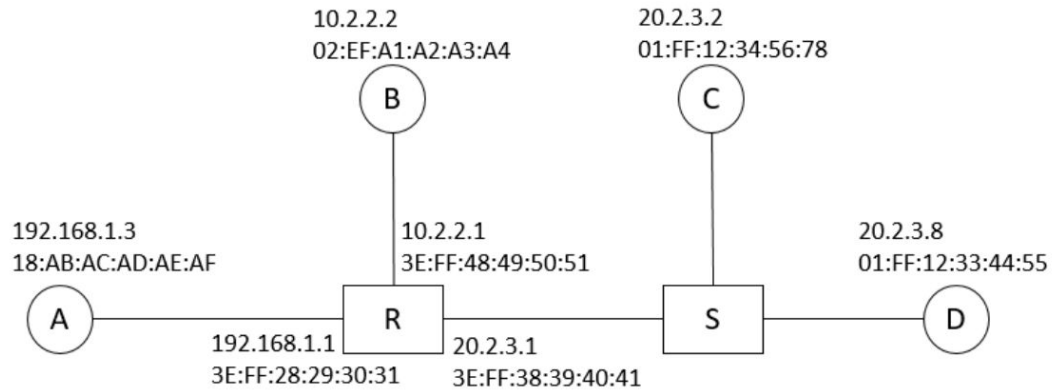
Interface 3

4.3 128.95.39.14 (2 pts)

The router does not know where to forward this packet, it will use the default entry where next hop is 128.17.0.1, and according to routing table, we will match to interface 3 as next hop.

5. ARP (10 pts)

Consider the IP network is shown below, where R is a router and S is a switch. A, B, C, and D are hosts. IP addresses and MAC addresses of hosts and router interfaces are listed as follows



In this question, we assume R has a complete routing table and S has a complete forwarding table. However, R's ARP cache is empty right now.

5.1 R received a packet with the following header

Ethernet Src	Ethernet Dst	IP Src	IP Dst	Payload
18:AB:AC:AD:AE:AF	3E:FF:28:29:30:31	192.168.1.3	20.2.3.2	...

Since R does not have anything in its ARP cache yet, it will not be able to fill in the Ethernet Dst field before it tries to send it to next hop. Thus, R will send out an ARP request first. Which host(s) will receive this ARP request sent by R? (2 pts)

C, D

5.2 After the device(s) received the ARP request from R, which will respond? (2 pts)

C

5.3 After the above operation was successfully completed, what would the new header of the packet that R sending out? (4 pts)

Ethernet Src	Ethernet Dst	IP Src	IP Dst	Payload
3E:FF:38:39:40:41	01:FF:12:34:56:78	198.168.1.3	20.2.3.2	...

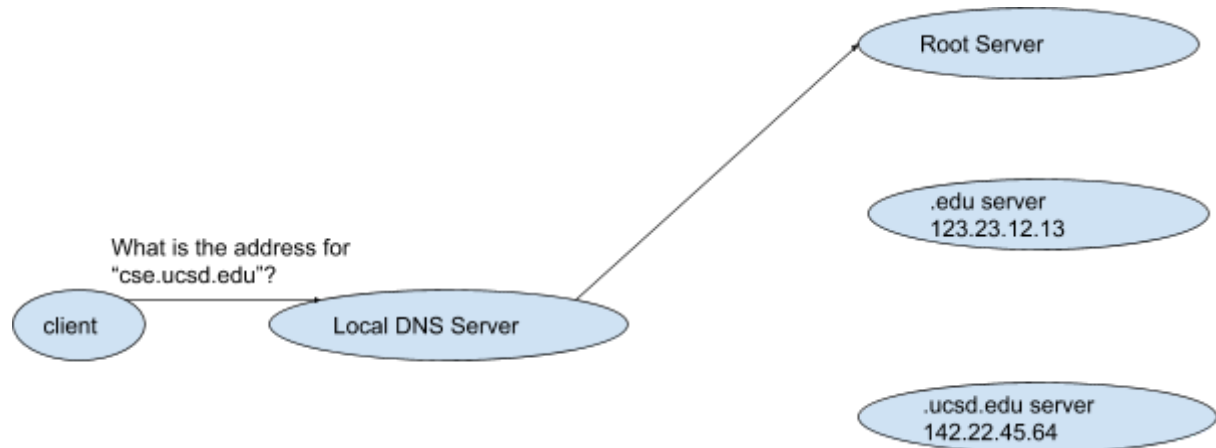
5.4 After the above operation was successfully completed, would R send out ARP requests again for this incoming packet? (2 pts)

Ethernet Src	Ethernet Dst	IP Src	IP Dst	Payload
18:AB:AC:AD:AE:AF	3E:FF:28:29:30:31	198.168.1.3	20.2.3.8	...

Yes, since there is still no cache for 20.2.3.8

6. Domain Name System (10 pts)

Assume we have the following name servers, and the client requests for the IP address resolution of `cse.ucsd.edu` (not a domain name in the real world, by the way).



What is the reply that the root name server sends to the local DNS server? What are the steps that are then followed in the DNS lookup to get the final address of the specified domain name? Assume that the local DNS server performs a recursive lookup each time on the remainder of the address and that the IP address for `cse.ucsd.edu` is `132.239.67.100`.

Ans:

