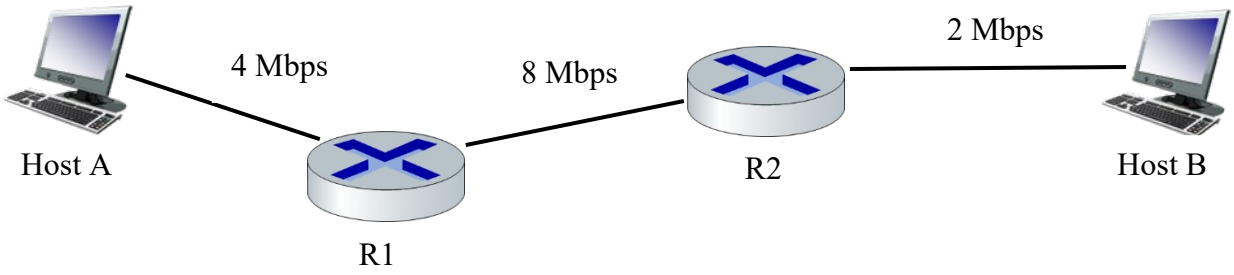
COM3032 Computer Networks Final Exam **02 June 2023**

1. Assume a data packet of size 2 Mb is to be send from Host A to Host B in the network shown below and the processing times for routers R1 and R2 are 20 and 30 ms. respectively. For the given link transmission rate values, **calculate the total time needed to send the packet and show the calculation details for each hop**. Propagation and queuing delays are negligible. (18 pts)



Host A to R1 (5 pts)

$d_{trans}+d_{proc}=2/4=0.5$ seconds

R1 to R2 (5 pts)

$d_{trans}+d_{proc}=(2/8)+0.02=0.27$ seconds

R2 to Host B (5 pts)

$d_{trans}+d_{proc}=(2/2)+0.03=1.03$ seconds

Total=1.8 seconds (3 pts)

2. Content of an HTTP request is shown as below:

```
GET /COM3032/midterm_exam.html HTTP/1.1
Host: lectures.ce.ankara.edu.tr
User-Agent: Mozilla/5.0
Accept-Language: en-us, en, tr
Connection: Close
```

2.a) What is the URL of the object requested by the browser? (5 pts)

lectures.ce.ankara.edu.tr/COM3032/midterm_exam.html

2.b) What version of HTTP is the browser running? (2 pts)

HTTP/1.1

2.c) What is the IP address of the host on which the browser is running? (5 pts)

IP address can not be determined from the content of an HTTP request.

3. Consider two hosts, A and B, connected by a single link of rate R bps. Suppose that the two hosts are separated by D meters, and suppose the propagation speed along the link is V meters/sec. Host A is to send a packet of size L bits to host B.

3.a) Express the propagation delay, d_{prop}, in terms of D and V. (3 pts)

d_{prop} = D/V seconds.

3.b) Determine the transmission time of the packet, d_{trans}, in terms of L and R. (3 pts)

d_{trans} = L/R seconds.

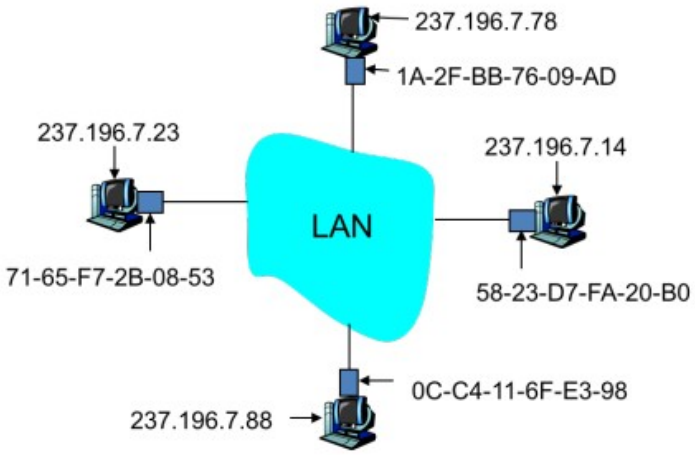
3.c) Ignoring processing and queueing delays, write an expression for the end-to-end delay. (3 pts)

$d_{end-to-end}$ = (D/V + L/R) seconds.

3.d) Suppose $V = 2.5 \times 10^8$, L = 120 bits, and R = 56 Kbps. Find the distance D so that d_{prop} equals d_{trans}. Assume that 1 Kbps = 1,000 bps. (5 pts)

D = V*(L/R) = (2.5×10^8)*120/(56×10^3) = 536 km.

4. Consider an Ethernet subnet just started up and the ARP table on all network interfaces are empty. Suppose the node with IP address 237.196.7.23 wants to send a data packet to the node with IP address 237.196.7.14.



4.a) What is the destination MAC address of the first Ethernet frame in this case? (5 pts)
FF-FF-FF-FF-FF-FF

4.b) What is the destination MAC address of the second Ethernet frame in this case? (5 pts)

71-65-F7-2B-08-53

4.c) What is the destination MAC address of the third Ethernet frame in this case? (5 pts)

58-23-D7-FA-20-B0

5. The table below is a forwarding table of a router.

Destination Prefix	Interface
11001000 00010111 0000	1
11001000 00010111 00001	2
11001000 00010111 00000	3
11001000 00010111 10001	4
default	5

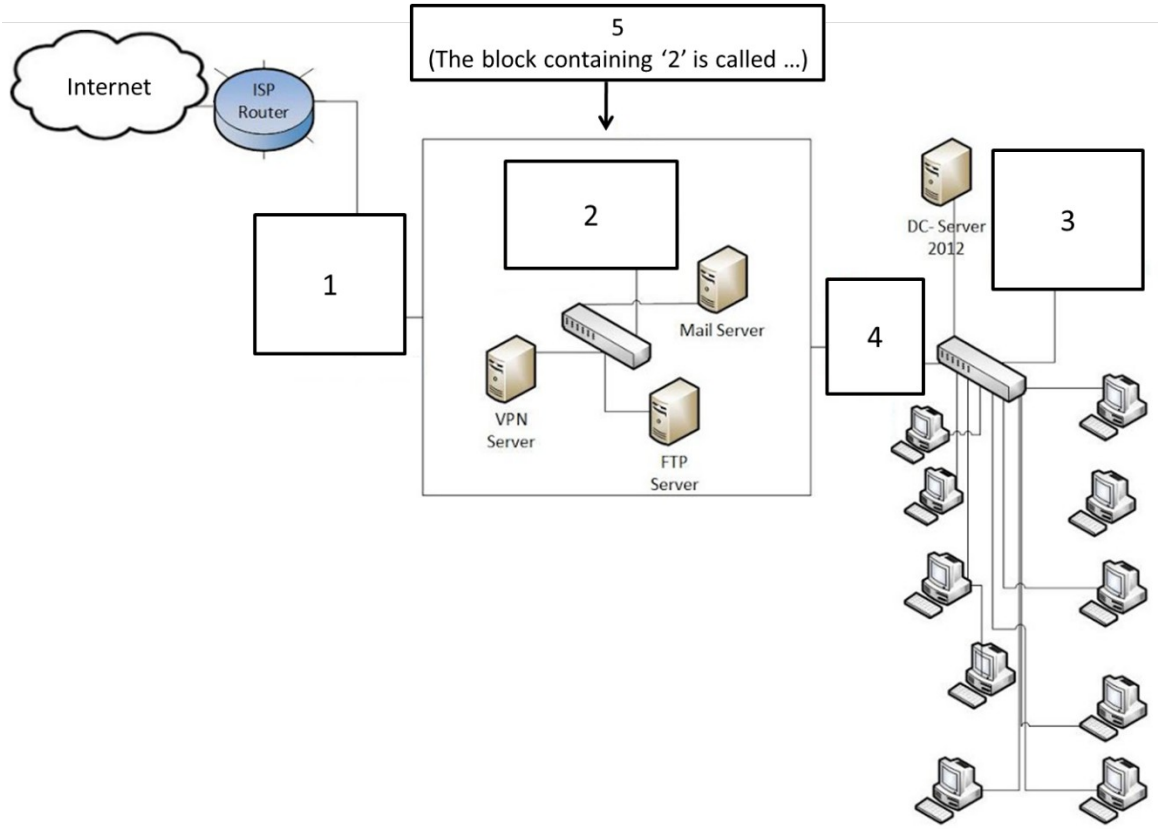
Assume that four packets come along with the destination addresses given below. Which interfaces will the four packets be forwarded to based on the longest match principle?

5.a) 11001000 00010111 01000000 10110000 (4 pts) 5
5.b) 11001000 00010111 00000011 10110000 (4 pts) 3
5.c) 11001000 00010111 00001000 10110000 (4 pts) 2
5.d) 11001000 00010111 10001000 10110000 (4 pts) 4

6. Pick the most appropriate server/system/term given below for the five boxes shown in the network diagram. Just write your answers on the right side of the box numbers.

TCP/UDP, Path of Physical Access, External Firewall, Path of Logical Access, Web Server, Antivirus/Endpoint Protection System Server, Protocol, ARP Server, DMZ, WAN, DSL, HFC, Internal Firewall, Socket, UTP, Layer, DoS, ATP

1 External Firewall (5 pts)
2 Web Server (5 pts)
3 Antivirus/Endpoint Protection System Server (5 pts)
4 Internal Firewall (5 pts)
5 DMZ (5 pts)


5
(The block containing '2' is called …)
Internet
ISP
Router
1
2
Mail Server
VPN
Server
FTP
Server
4
DC- Server
2012
3