CS & IT ENGINEERING

COMPUTER NETWORKS

Flow control

Lecture No-1

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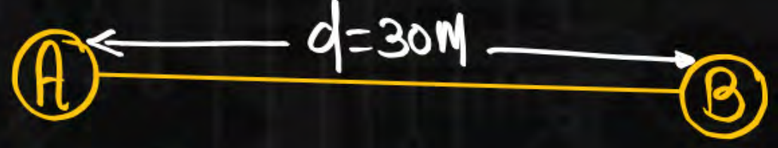
Delay in computer Networks

Bandwidth:

- Bandwidth represent the rate at which no. of bits placed on the link in one sec.

Velocity:

- Represent the rate, distance covered in one sec.



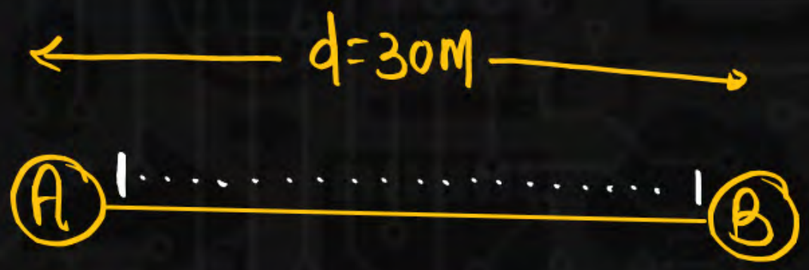
Trans Exe
100 bits
From A to B

$B = 1 bps = 1 bit/sec$

$v = 10 m/sec$

Total time = 100 sec + 3 sec

Total time = 103 sec



$B = 1bps = 1 bit/sec$

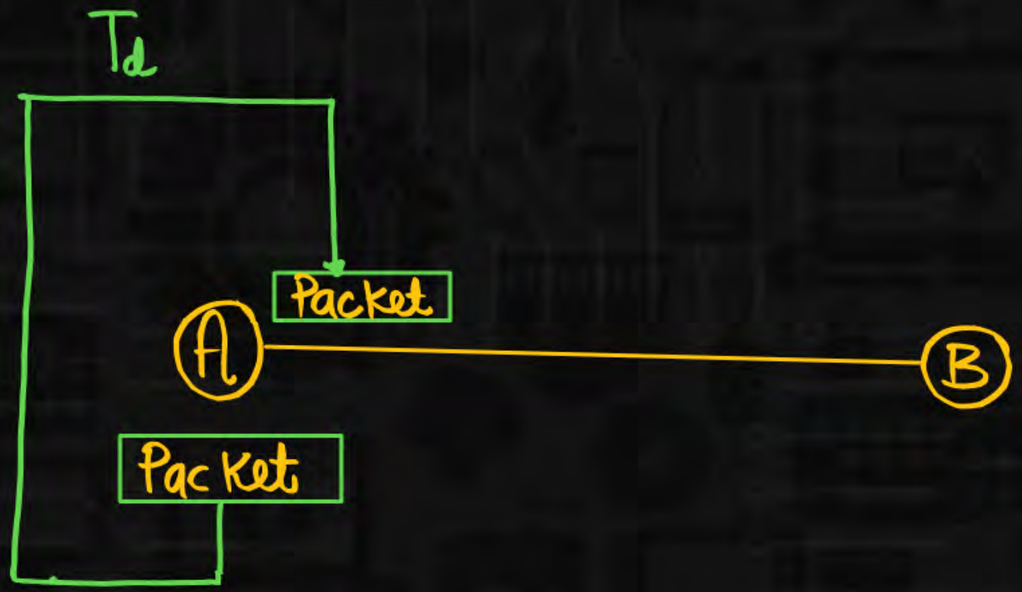
$v = 10m/sec$

Delay in Computer Network

1. Transmission delay [T_d]
2. Propagative delay [P_d]
3. Queuing delay [Q_d]
4. Processing delay [P_{rd}]

Transmission delay

Amount of time taken to transfer a Packet on to the outgoing is called as Transmission delay.



(1) 

Packet size = 1000 bits

Bandwidth(B) = 2bPs = 2 bits|sec

$$\text{Transmission delay} = \frac{1000 \text{ bits}}{2 \text{ bits|sec}}$$

Transmission delay = 500sec

(2) 

Packet size = 100 bits

Bandwidth = 10bPs = 10 bits|sec

$$\text{Transmission delay} = \frac{100 \text{ bits}}{10 \text{ bits|sec}}$$

Transmission delay = 10sec

$$\text{Transmission delay} = \frac{\text{Packet size or Length of Packet}}{\text{Bandwidth}}$$

$$T_d = \frac{L}{B}$$

(1) $L = 8000 \text{ bits}$, $B = 8000 \text{ bps} = 8000 \text{ bits/sec}$, $T_d = ?$

$$T_d = \frac{L}{B} = \frac{8000 \text{ bits}}{8000 \text{ bits/sec}}$$

$$\boxed{T_d = 1 \text{ sec}}$$

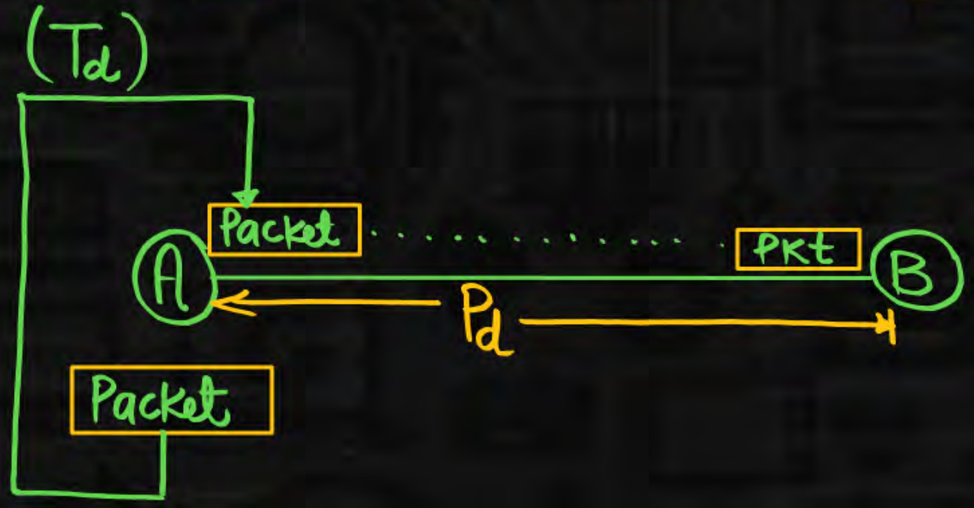
(2) $L = 8K \text{ bits}$, $B = 8K \text{ bps} = 8K \text{ bits/sec}$, $T_d = ?$

$$T_d = \frac{L}{B} = \frac{8 * 1024 \text{ bits}}{8 * 10^3 \text{ bits/sec}} = \frac{8192}{8000} \text{ sec} = 1.024 \text{ sec}$$

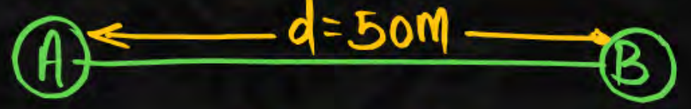
	Data	Bandwidth
K	$1024 (2^{10})$	10^3
M	$1024 * 1024 (2^{20})$	10^6
G	$1024 * 1024 * 1024 (2^{30})$	10^9

Propagation delay

Amount of time taken to reach a packet from one point to another point is called as propagation delay.



(1)



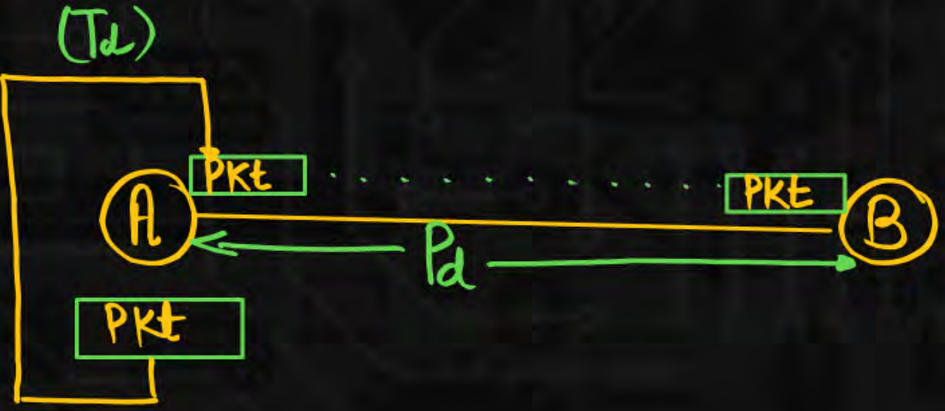
$v = 10m/sec$

$$\text{Propagation delay} = \frac{50m}{10m/sec}$$

Propagation delay = 5 sec

Propagation delay = $\frac{\text{distance}}{\text{velocity}}$

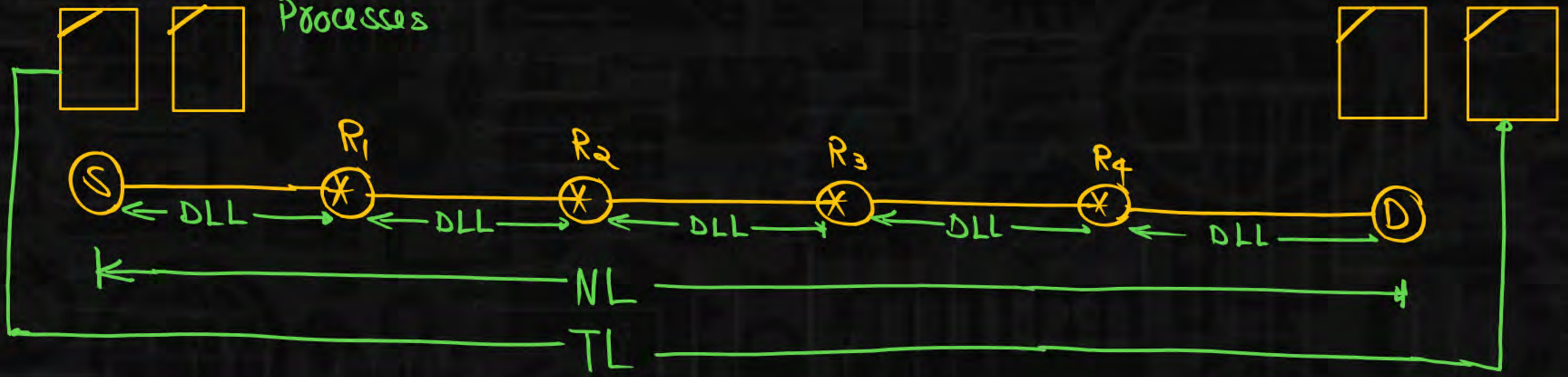
$$P_d = \frac{d}{v}$$



Total time taken to send a Packet From A to B = $T_d + P_d$

Queuing delay

The amount of time packet will wait in the queue at a router before being taken up for processing is called as Queuing delay.



DLL → Node to Node
or
Hop to Hop

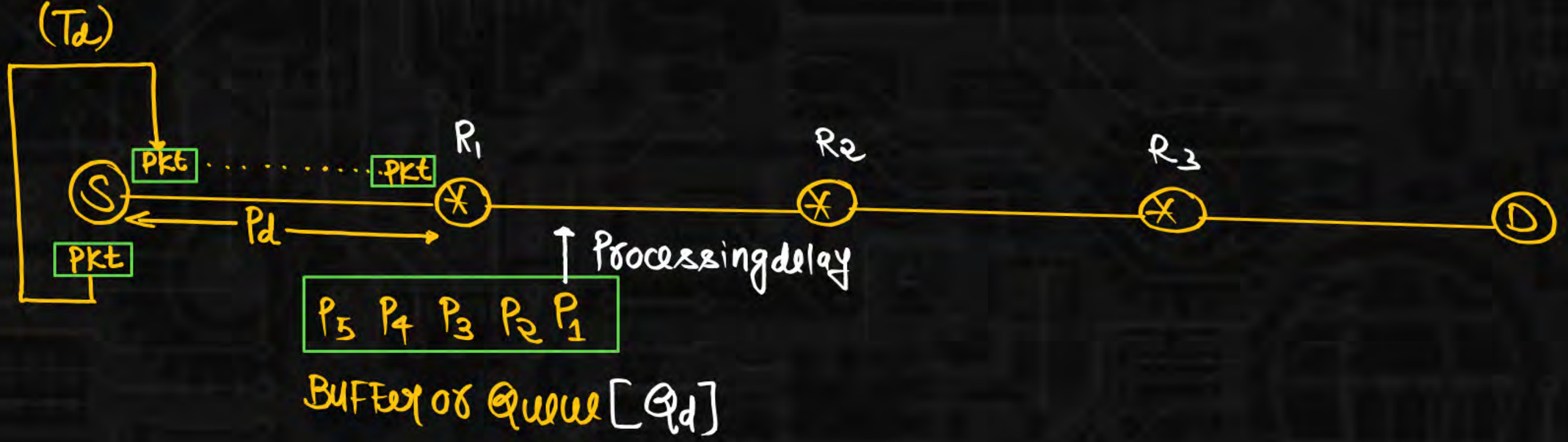
NL → Source Host to Destination Host

TL → Process to Process
or
end to end

DLL → MAC Add or Physical Address = 48 bit

NL → IP Add or Logical Add = 32 bit (IPv4)

TL → Port No or service Point Add = 16 bit


(Td)
Pkt
Pkt
Pkt
S
Pd
R1
R2
R3
D
Processingdelay
P5 P4 P3 P2 P1
Buffer or Queue [Qd]


Raju
seema
Geeta
meena
Rani

OSI Model

⇓

7 Layers

⇓

Application Layer
Presentation Layer
Session Layer
Transport Layer
Network Layer
Data Link Layer
Physical Layer

TCP/IP Model

⇓

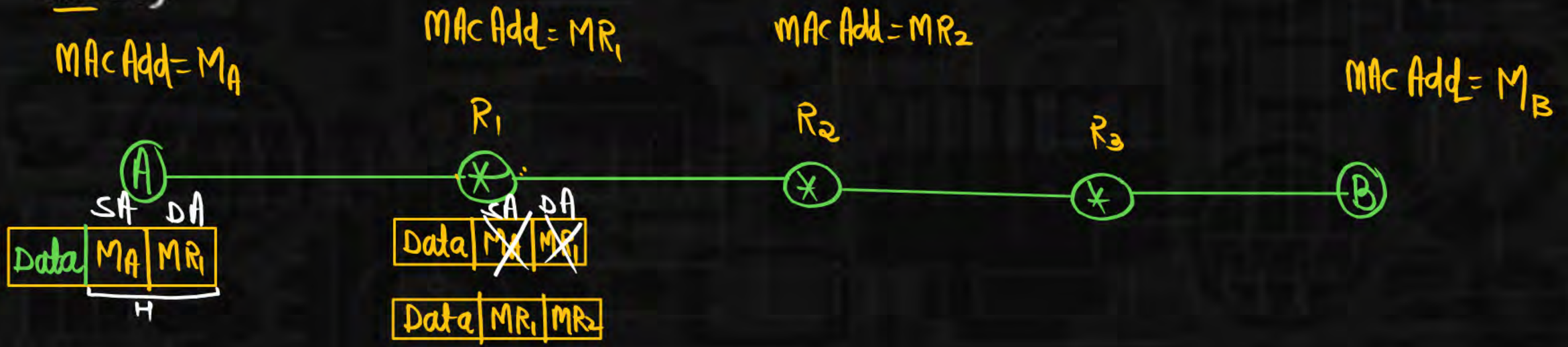
5 Layers

⇓

Application Layer
Transport Layer
Network Layer
Data Link Layer
Physical Layer

Processing delay

Processing delay is the time required for a router or a destination host to receive packet from its input port, remove the header, perform an error detection procedure, and deliver the packet to output port(in case of router)or deliver the packet to upper layer protocol (in case of destination host)



TCP/IP Model

Problem Solving
on
Delay in Computer Network

Q.1 If the packet size is 1 KB and channel capacity is 10^9 bits/sec, what is the transmission time ?

Packet size = 1 KB = 1024 Byte = 1024 * 8 bits
= 8192 bits

A. 6 μs

B. 10 μs

C. 8 μs ✓

D. Cannot be calculated

$B = 10^9$ bits/sec

$$T_d = \frac{\text{Packet size}}{\text{Bandwidth}}$$

$$= \frac{8192 \text{ bits}}{10^9 \text{ bits/sec}}$$

$$= \frac{8192}{10^3 * 10^6} \text{ sec}$$

$$= 8.192 * 10^{-6} \text{ sec} = 8.192 \text{ μsec} \approx 8 \text{ μsec}$$

Q.2

Consider two hosts X and Y, connected by a single direct link of rate 10^6 bits/sec. The distance between the two hosts is 10,000 km and the propagation speed along the link is 2×10^8 m/sec. Host X send a file of 50,000 bytes as one large message to host Y continuously. Let the transmission and propagation delay be p millisecond and q milliseconds, respectively. Then the value of p and q are.

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$B = 10^6$ bits/sec , $d = 10,000$ KM

$v = 2 * 10^8$ m/sec $= 2 * 10^5$ km/sec

File size or Msg size (L) = 50,000 Byte
= 8 * 50,000 bits
= 400000 bits

(A) p = 50 and q = 100

(B) p = 50 and q = 400

(C) p = 100 and q = 50

(D) p = 400 and q = 50 ✓

(p) $T_d = \frac{L}{B} = \frac{400000 \text{ bits}}{10^5 \text{ bits/sec}}$

$= 400 * 10^{-3} \text{ sec}$

$= 400 \text{ m sec}$

(q) $P_d = \frac{d}{v}$

$= \frac{10,000 \text{ km}}{2 * 10^5 \text{ km/sec}}$

$= 50 * 10^{-3} \text{ sec}$

$= 50 \text{ m sec}$

Q.3

Consider two computers, X and Y connected via a single Bandwidth 512 Gbps. Suppose that both hosts are separated by distance M meters, and the propagation delay along the link is 2×10^9 meter/sec. Computer X has to send a packet of size 1 Kbyte to computer Y. What will be the distance M such that the delay in propagation هذا equal to the delay in transmission ?

H.W

A 35 meter

B 34 meter

C 33 meter

D 32 meter

Q.4

Consider a 100 Mbps link between an earth station(sender) and a satellite (receiver) at an altitude of 2100 km. The signal propagates at a speed of 3×10^8 m/s. The time taken

(in milliseconds, rounded off to two decimal places) for the receiver to completely receive a packet of 1000 bytes transmitted by the sender is ____.

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(7.08 msec)

H.W

Q.5

Which of the following delay is faced by the packet in travelling from one end system to another?

A. Propagation delay

B. Queuing delay

C. Transmission delay

D. All of the mentioned


THANK YOU
GW
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