CS & IT ENGINEERING

COMPUTER NETWORKS

TCP & UDP

Lecture No-9

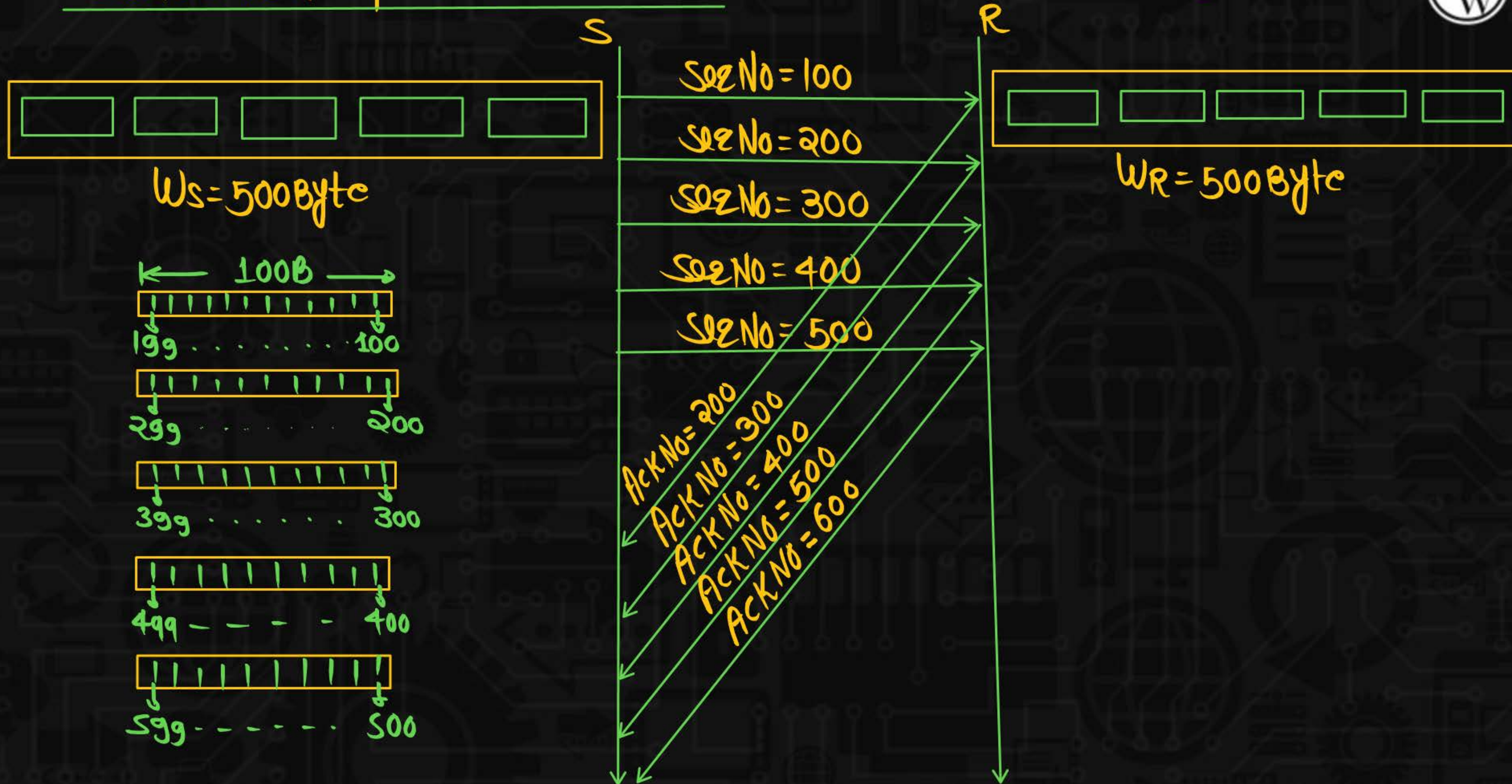By- Ankit Doyla Sir

TOPICS TO
BE
COVERED

Error control in TCP

Error control in TCP:

> TCP can use both selective and cumulative acknowledgement.

> Receiver may choose to send independent ACK or cumulative ACK

> TCP uses a combination of selective repeat and GO-Back-N protocol protocol for error control and flow control.

> In TCP sender window size = receiver window size.

> In TCP out of order packets are accepted by the receiver.

When ever receiver receives an out of order packet ,it accept that packet but send an acknowledgement for the expected packet.

> Out of order segments are never delivered to the process.

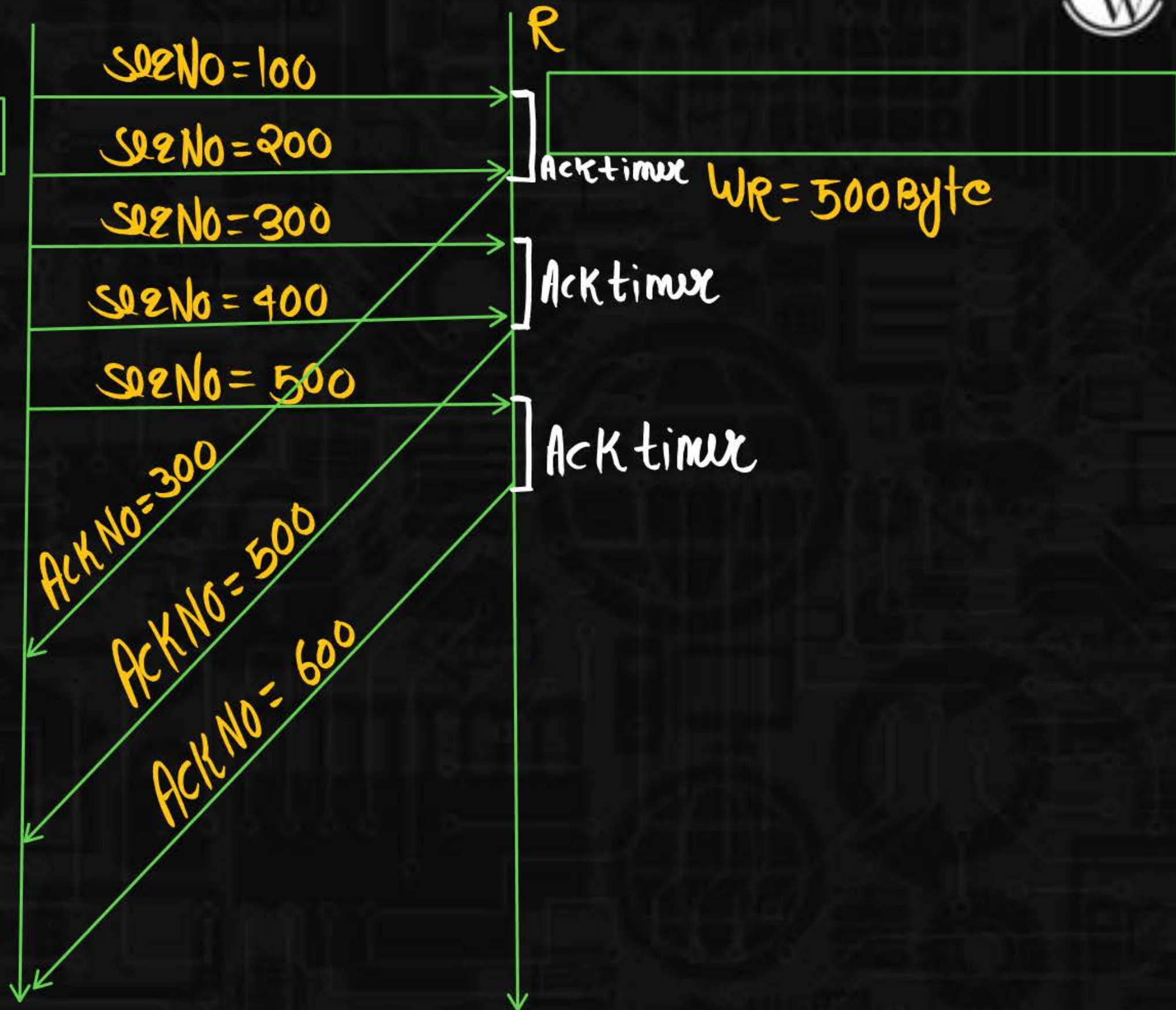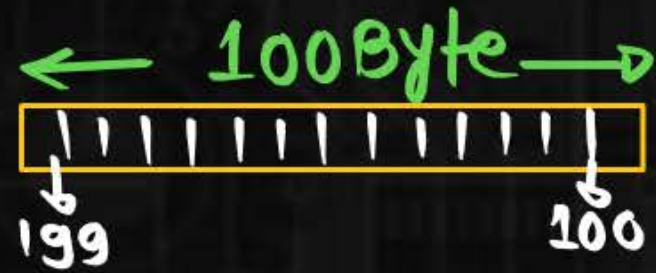> TCP guarantee that data are delivered to process in order.

Selective Ack | Independent Ack

S   R

$SeeNo = 100$

$SeeNo = 200$

$SeeNo = 300$

$SeeNo = 400$

$SeeNo = 500$

$W_S = 500 Byte$

$W_R = 500 Byte$

$\leftarrow 100B \rightarrow$

$199 \cdots\cdots 100$

$299 \cdots\cdots 200$

$399 \cdots\cdots 300$

$499 \;-\;-\;-\;- \; 400$

$599 \;-\;-\;-\;-\;-\;- \; 500$

$AckNo = 200$

$AckNo = 300$

$AckNo = 400$

$AckNo = 500$

$AckNo = 600$

Cumulative Ack
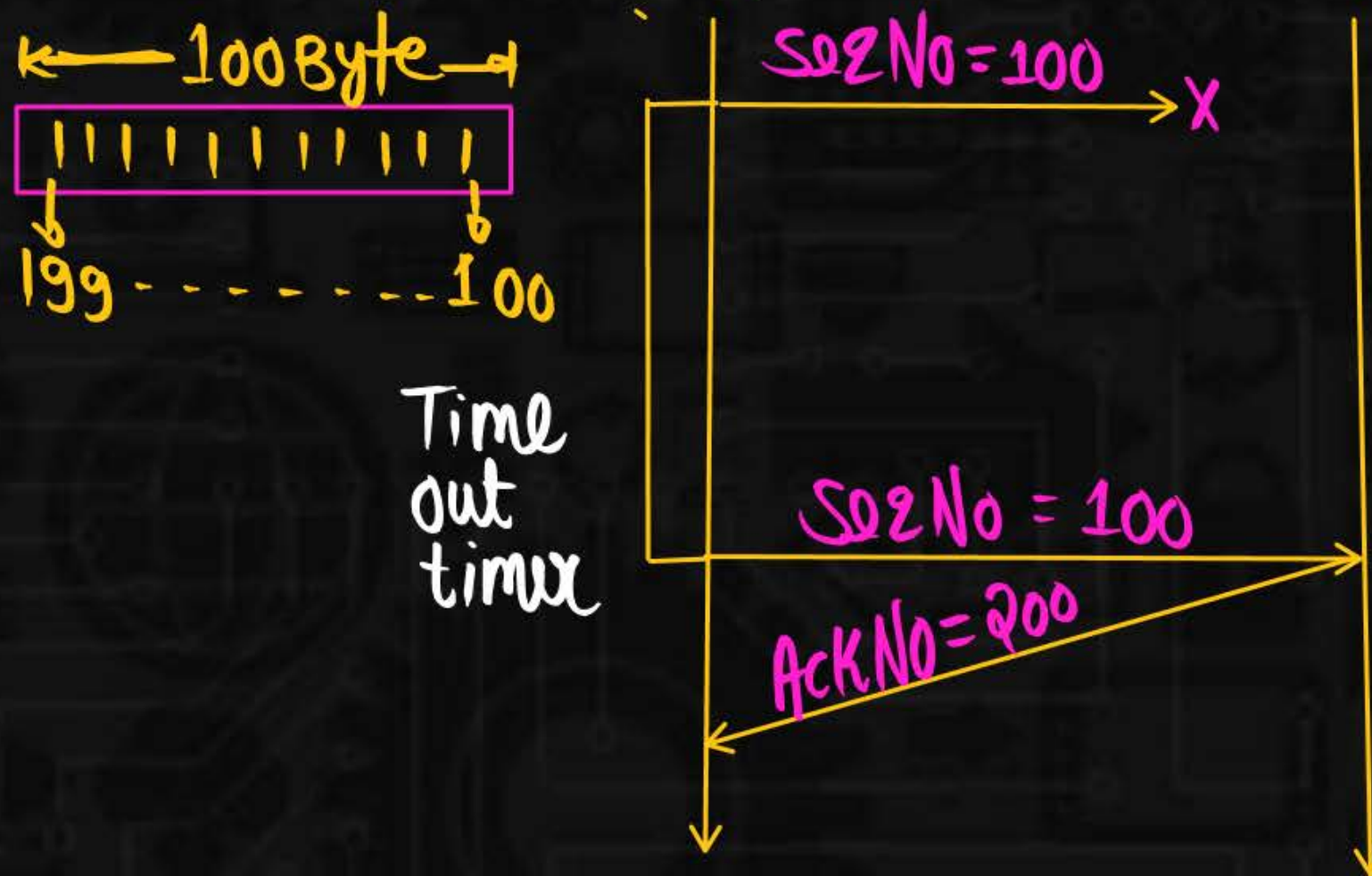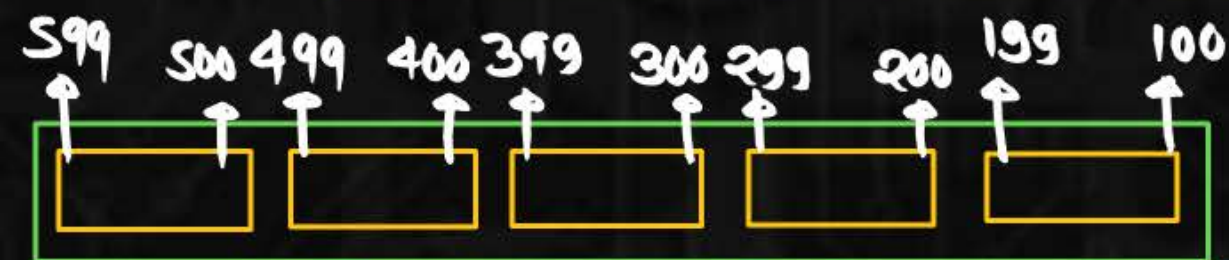
Retransmission in TCP

(i) Retransmission after time out timer
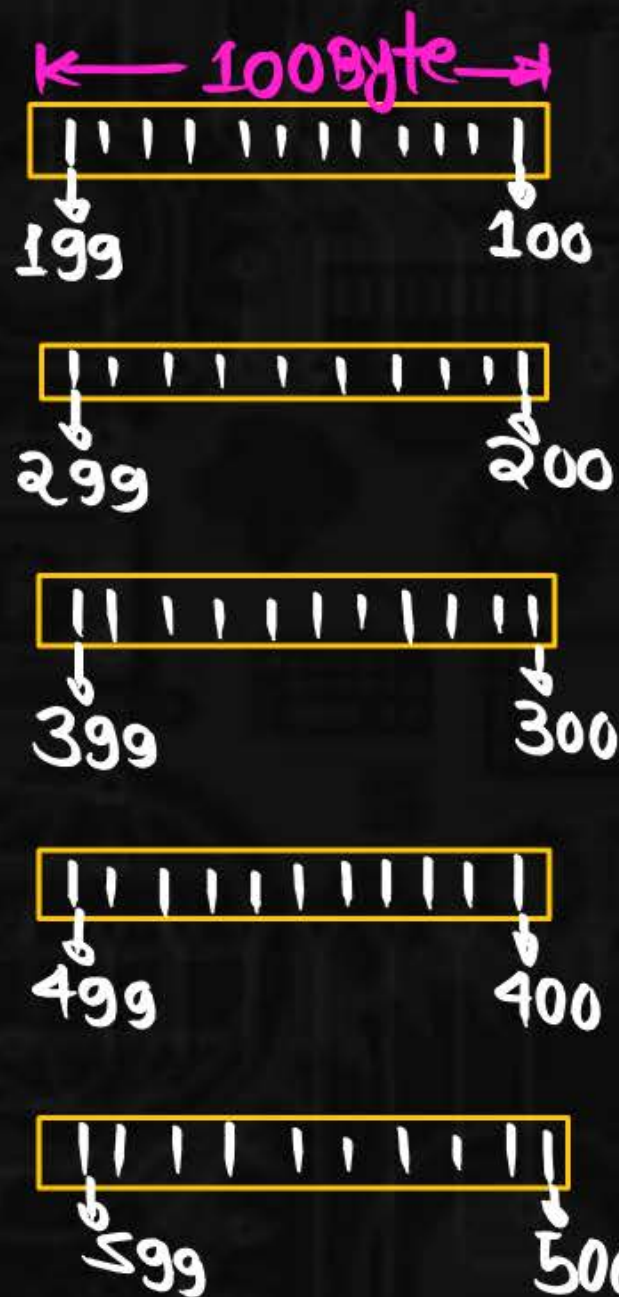
(ii) Retransmission after 3 duplicate Ack

(i) Retransmission after time out timer

$\longleftarrow$ 100 Byte $\longrightarrow$

199 - - - - - - - - 100

Seq No = 100 $\longrightarrow$ X

Time out timer

Seq No = 100

Ack No = 200

(ii) Retransmission after 3 duplicate Ack [Fast Retransmission]

Sender window (left): 599, 500, 499, 400, 399, 300, 299, 200, 199, 100

$W_S = 500$ Byte

Receiver window (right): 100, 199, 200, 299, 300, 399, 400, 499, 500, 599

$W_R = 500$ Byte

100 Byte segment boxes:
- 199 ... 100
- 299 ... 200
- 399 ... 300
- 499 ... 400
- 599 ... 500
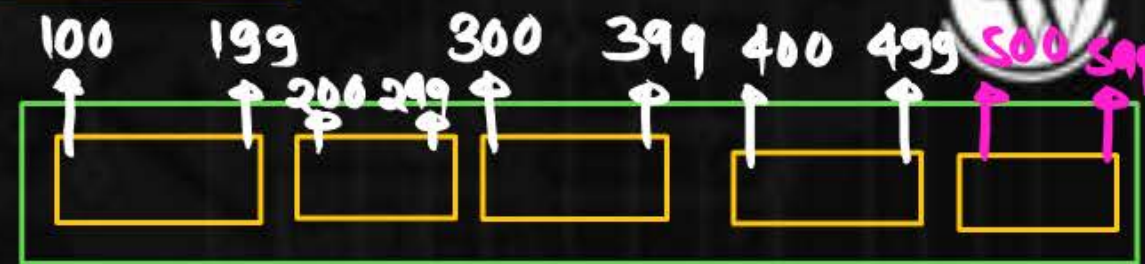
Middle transmission diagram:

SeqNo = 100

SeqNo = 200 → X

SeqNo = 300

SeqNo = 400

SeqNo = 500

Ack No = 200

Ack No = 200
Ack No = 200
Ack No = 200

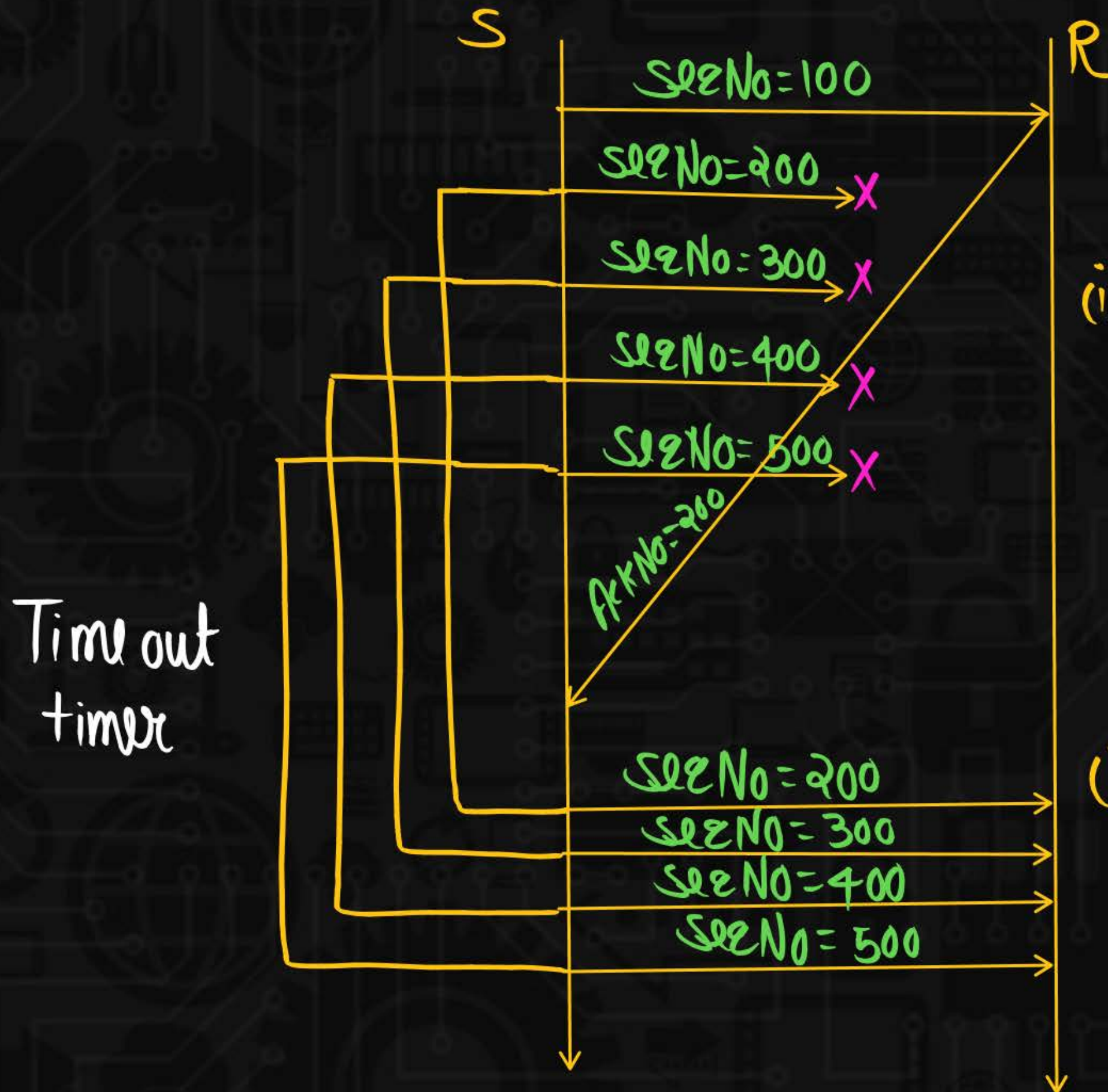→ 3 duplicate Ack
↕
Indicate mild congestion condition

T.O

SeqNo = 200
Ack No = 600

S   R

SeqNo=100

SeqNo=200 ✗

SeqNo=300 ✗

SeqNo=400 ✗

SeqNo=500 ✗

AckNo=200

SeqNo=200
SeqNo=300
SeqNo=400
SeqNo=500

Time out timer

Note

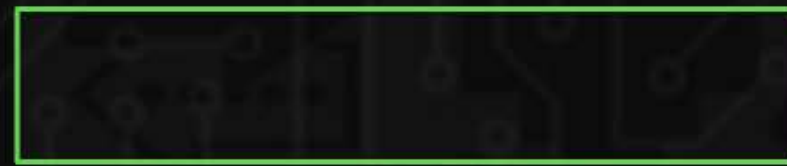(i) $\mathcal{I}$F 3 duplicate Ack Not possible then we use Time out timer concept For retransmitting the Lost Packet

(ii) Time out timer indicate severe Congestion condition
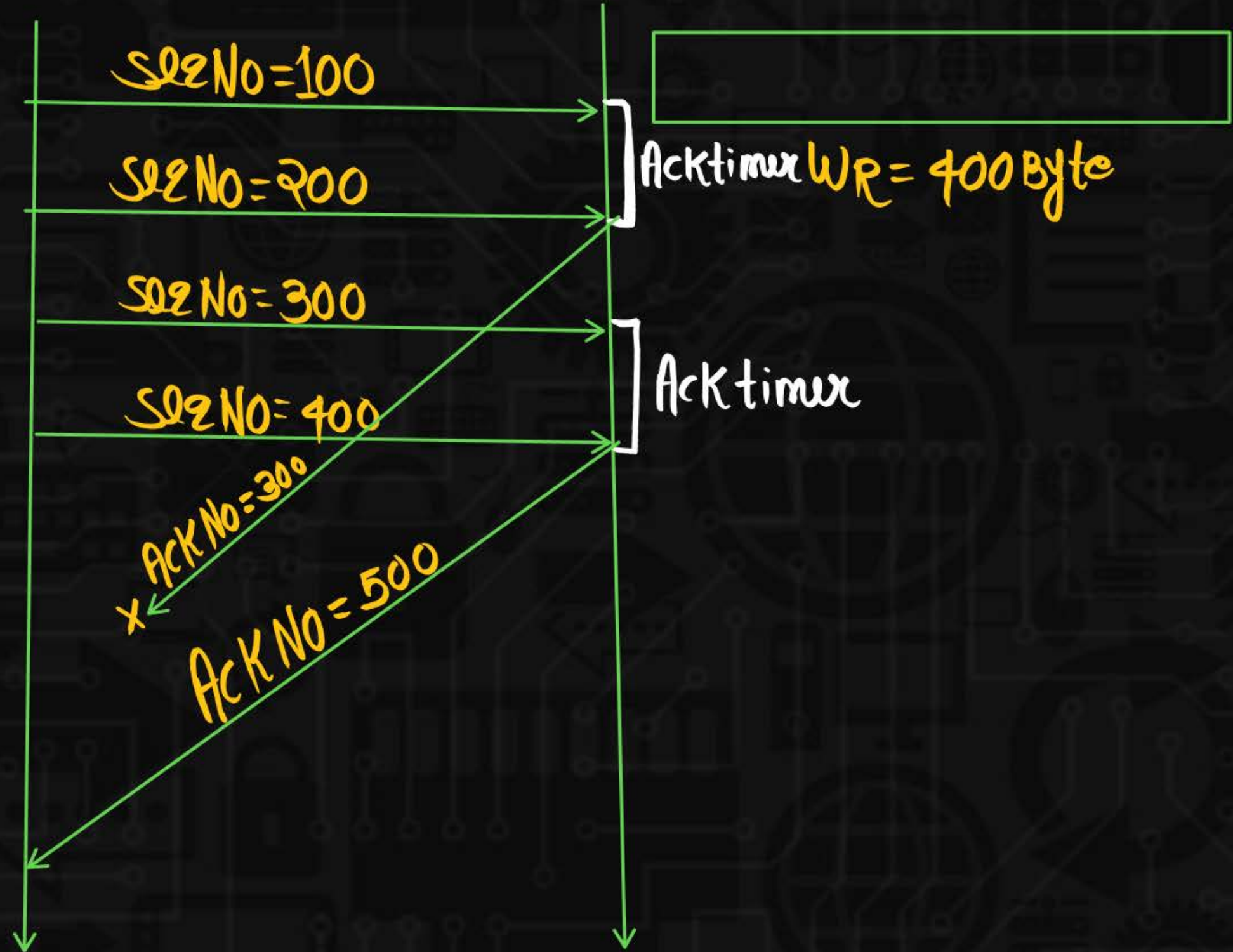
Lost Acknowledgement

(i) Automatically corrected Lost Ack

(ii) Lost Ack corrected by Resending
    the segment

(i) Automatically corrected Lost Ack

$W_S = 400\,\text{Byte}$

$\longleftarrow 100\,\text{Byte} \longrightarrow$

199	100

299	200

399	300

499	400

Seq No = 100

Seq No = 200

Ack timer $W_R = 400\,\text{Byte}$

Seq No = 300

Seq No = 400

Ack timer

Ack No = 300

X

Ack No = 500

(ii) Lost Ack Corrected by Resending the segment

$Ws = 200\,Byte$

$\leftarrow 100\,Byte \rightarrow$

$199 \cdots\cdots 100$

$299 \qquad 200$

$SeqNo = 100$

$SeqNo = 200$

$AckNo = 300$

Ack time

$WR = 200\,Byte$

T.O

$SeqNo = 100$

$AckNo = 300$
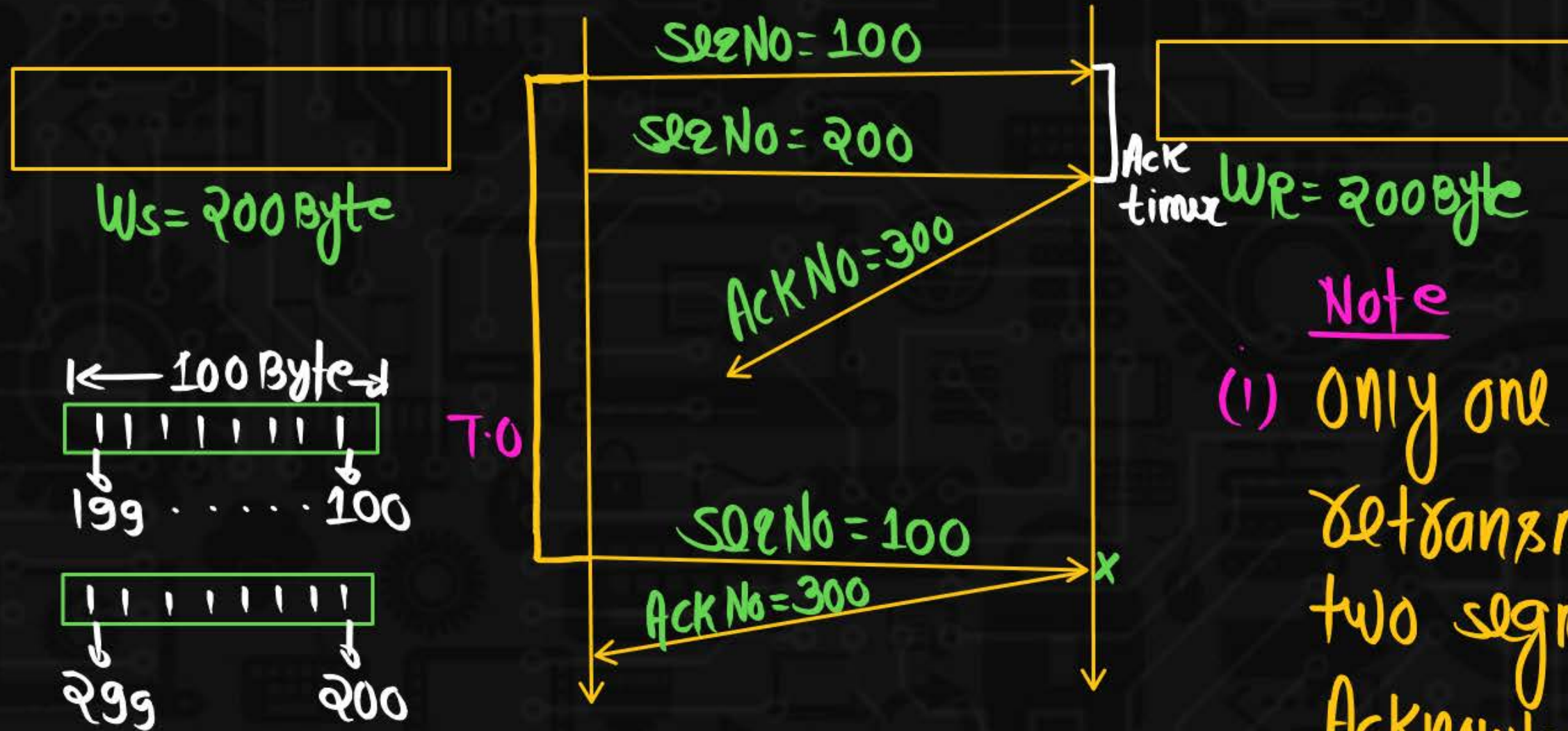
Note

(i) Only one segment is retransmitted Although two segments are Not Acknowledge