CS & IT ENGINEERING

COMPUTER NETWORKS

Flow Control

Lecture No-8

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TOPICS TO BE COVERED

Go-Back-N ARQ

Q.3

In GB-3, If every 4^{th} packet that is being transmitted is lost and if we have to send 10 packet then how many total transmission are required.

GB-3, 4^{th} Lost, 10 PKts

$\boxed{1\ 2\ 3}\ \boxed{4\ 5\ 6}\ 4\ \boxed{5\ 6\ 7}\ 5\ \boxed{6\ 7\ 8}\ 6\ \boxed{7\ 8\ 9}\ 7\ \boxed{8\ 9\ 10}\ 8\ \boxed{9\ 10}\ 9\ 10$

Total transmission = 27

Q.4

Station (A) needs to send a message of 9 packets where send windows = 3. All packets are ready and immediately available for transmission. By using GBN strategy, if every fifth packet gets lost, then what is the number of packets that station (A) will transmit for sending all its message _____.

Gate-2016

$W_s = 3$, 9 Pkts, 5^{th} Lost

$\boxed{1\ 2\ 3}\ 4\ \boxed{\underset{\times}{5}\ 6\ 7}\ 5\ 6\ \boxed{\underset{\times}{7}\ 8\ 9}\ 7\ 8\ \boxed{\underset{\times}{9}\quad}\ 9$

Total transmission = 16

Q.5 Station A needs to send a message consisting of 15 packets to station 'B' using a sling window (window size 4) and go-back-N error control strategy. All packets are ready and immediately available for transmission. If every 6th packet that 'A' transmits gets lost (but no Acks from 'B' every gets lost), then what is the number of packets that 'A' will transmit for sending the message to 'B' ?

(A) 29

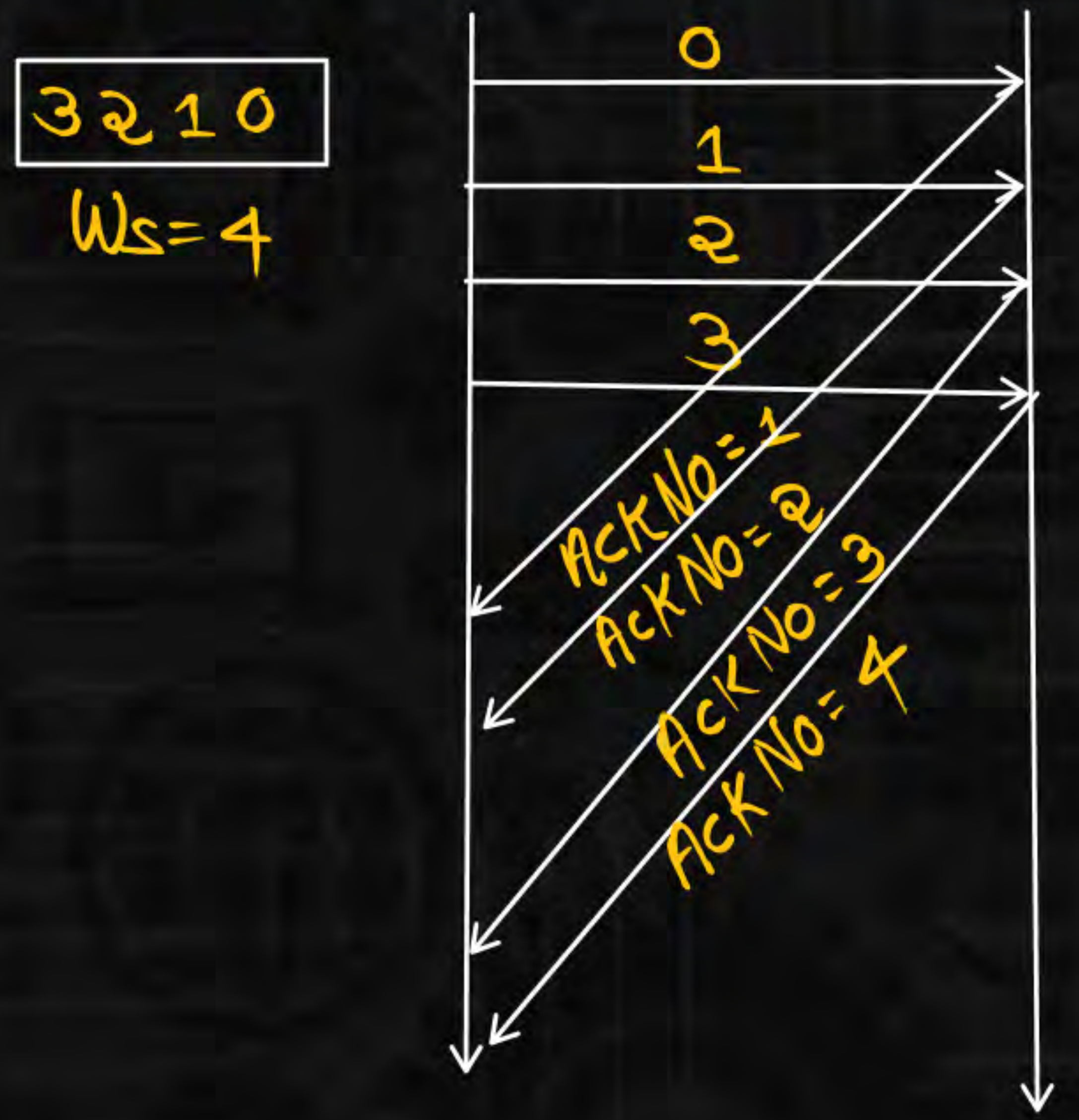
(B) 33

(C) 27

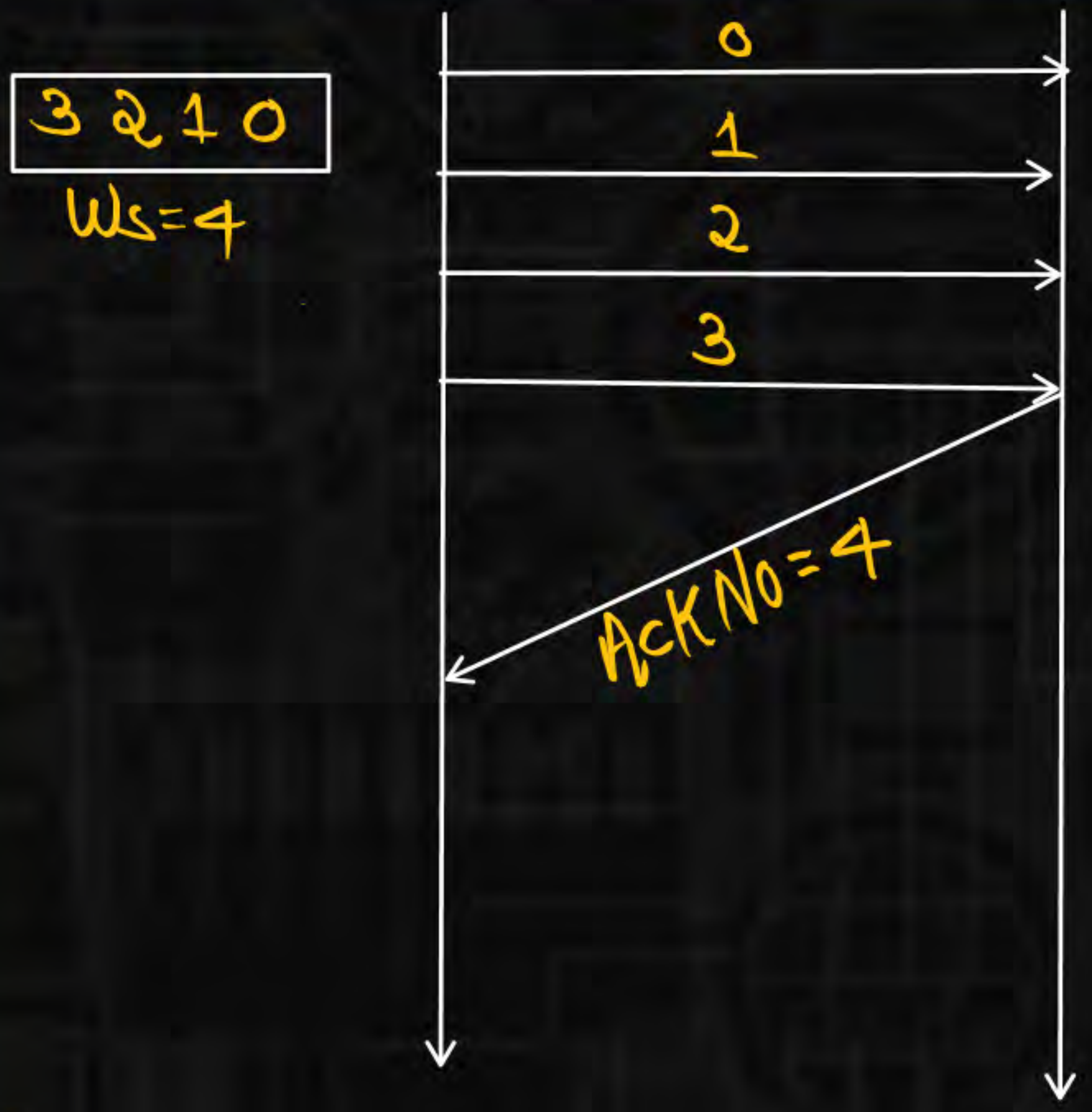
(D) 28

AcK

Independent Ack



Cumulative Ack



Note

1. stop and wait Protocal uses Independent Acknowledgement and Acknowledgement Number defines the Number of next expected Frame

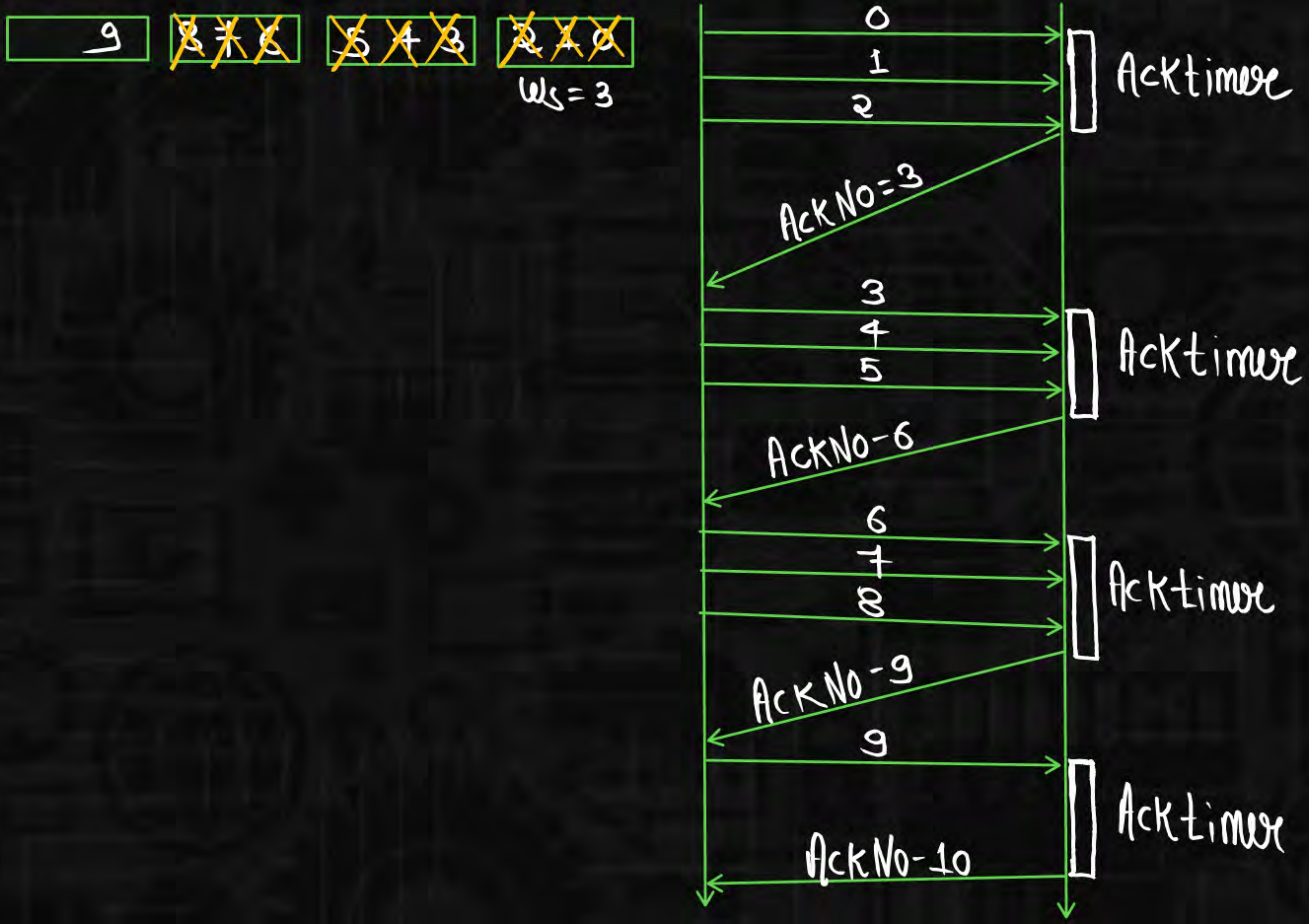
2. GB-N uses cumulative Acknowledgement and Acknowledgement Number defines the Number of next expected Frame

3. $\boxed{\text{Ack timer} < \text{Time out timer}}$

or

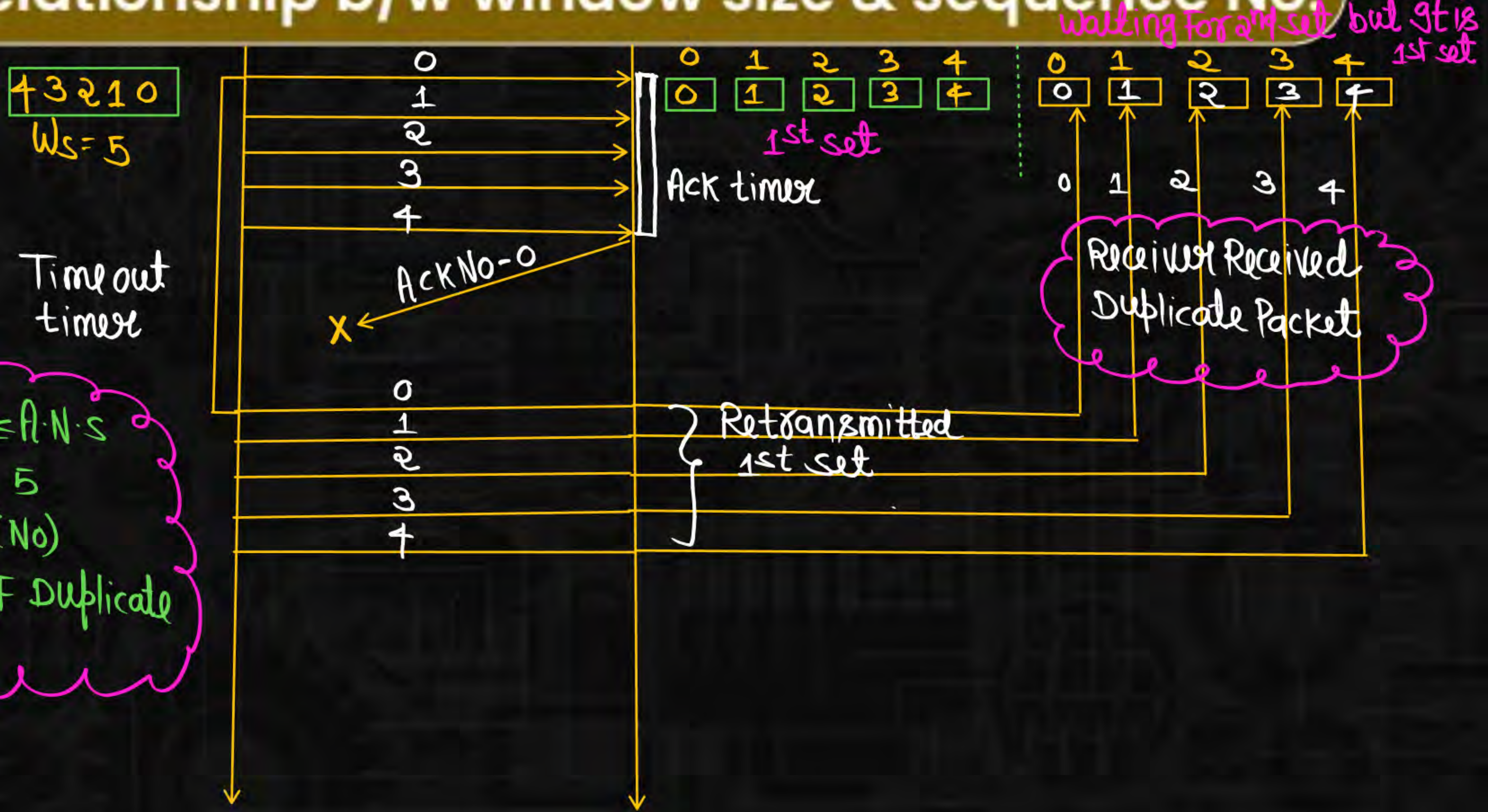
$\boxed{\text{Time out timer} > \text{Ack timer}}$

GB-3 , 10 Pkts (0-9)



GB-5 , SeqNo = 5 (0-4)

Relationship b/w window size & sequence No.



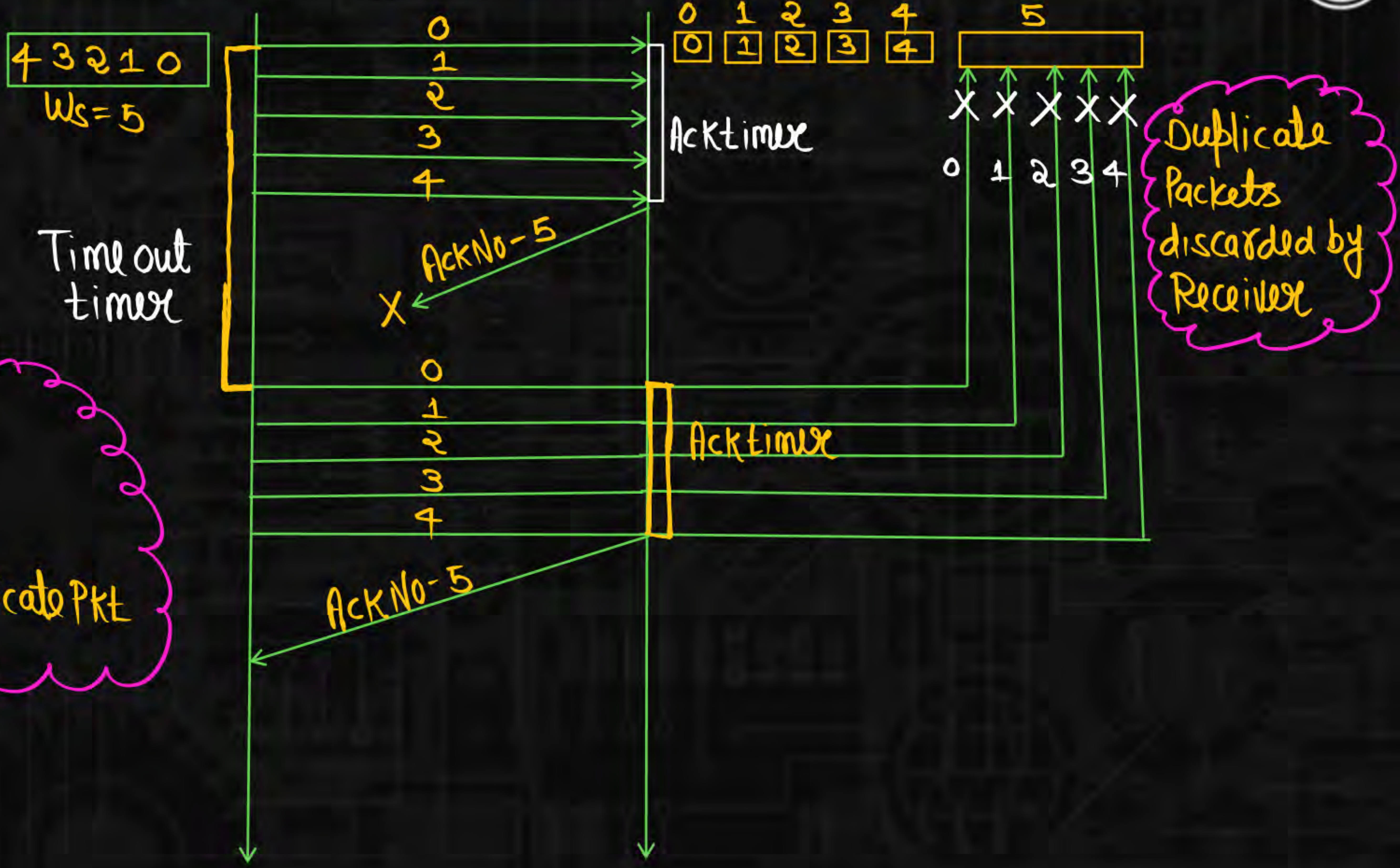
$W_S + W_R \leq A.N.S$

$5 + 1 \leq 5$

$6 \leq 5$ (No)

Problem of Duplicate Pkt

GB-5, Seq No = 6(0-5)



$W_s + W_R \le A.S.N$

$5 + 1 \le 6$

$6 \le 6$ (yes)

No Problem of Duplicate Pkt

Note

① Duplicate Packet Problem can be solved by increasing the sequence Number or decreasing the sender window size

② Duplicate Packet Problem can be solved by using the Formula

$\boxed{W_S + W_R \leq A.S.N.}$ (Available sequence Number)

W_R size: In the GB-N the window receiver size is equal to one always irrespective of window sender size (W_R=1)

W_S size: Window sender size is calculated based on the following formula

$\boxed{W_S + W_R \le A.S.N}$

$W_S + 1 \le A.S.N$

$\boxed{W_S \le A.S.N - 1}$

$W_S + W_R \le A.S.N$

$W_S + 1 \le A.S.N$

$\boxed{W_S \le A.S.N - 1}$

$W_S \le 6 - 1$ (Available Seq No = 6 (From Last Diagram)

$\boxed{W_S \le 5}$

1. SeqNo = 6 (0-5)

W_S	W_R
5	1

2. SeqNo = 16 (0-15)

W_S	W_R
15	1

3. SeqNo = N [0 - N-1]

W_S	W_R
N-1	1

4. SeqNo = 3bit

total SeqNo = $2^3 = 8$ (0-7)

W_S	W_R
7 [2^3-1]	1

5. SeqNo = 4 bit

Total sequence No = $2^4 = 16$ (0-15)

W_S	W_R
15 [2^4-1]	1

6. SeqNo = K bit

W_S	W_R
$2^K - 1$	1

7.

W_S	W_R	minimum sequence Number required
5	1	6
15	1	16
25	1	26
N	1	N+1

$\boxed{\text{minimum sequence Number required in GB-N} = W_S + W_R}$

Seq. No. = 8 (0-7)

W_S	W_R
7	1 ✓
6	1 ✓
5	1 ✓
4	1 ✓
3	1 ✓
2	1 ✓
1	1 ✗ [GB-N $(N > 1)$] It is stop & wait
2	2 ✗ ($W_R = 1$ Always in GB-N)

$$W_S + W_R \le A \cdot S \cdot N$$
$$W_S + 1 \le A \cdot S \cdot N$$
$$W_S \le A \cdot S \cdot N - 1$$
$$W_S \le 8 - 1$$
$$W_S \le 7$$

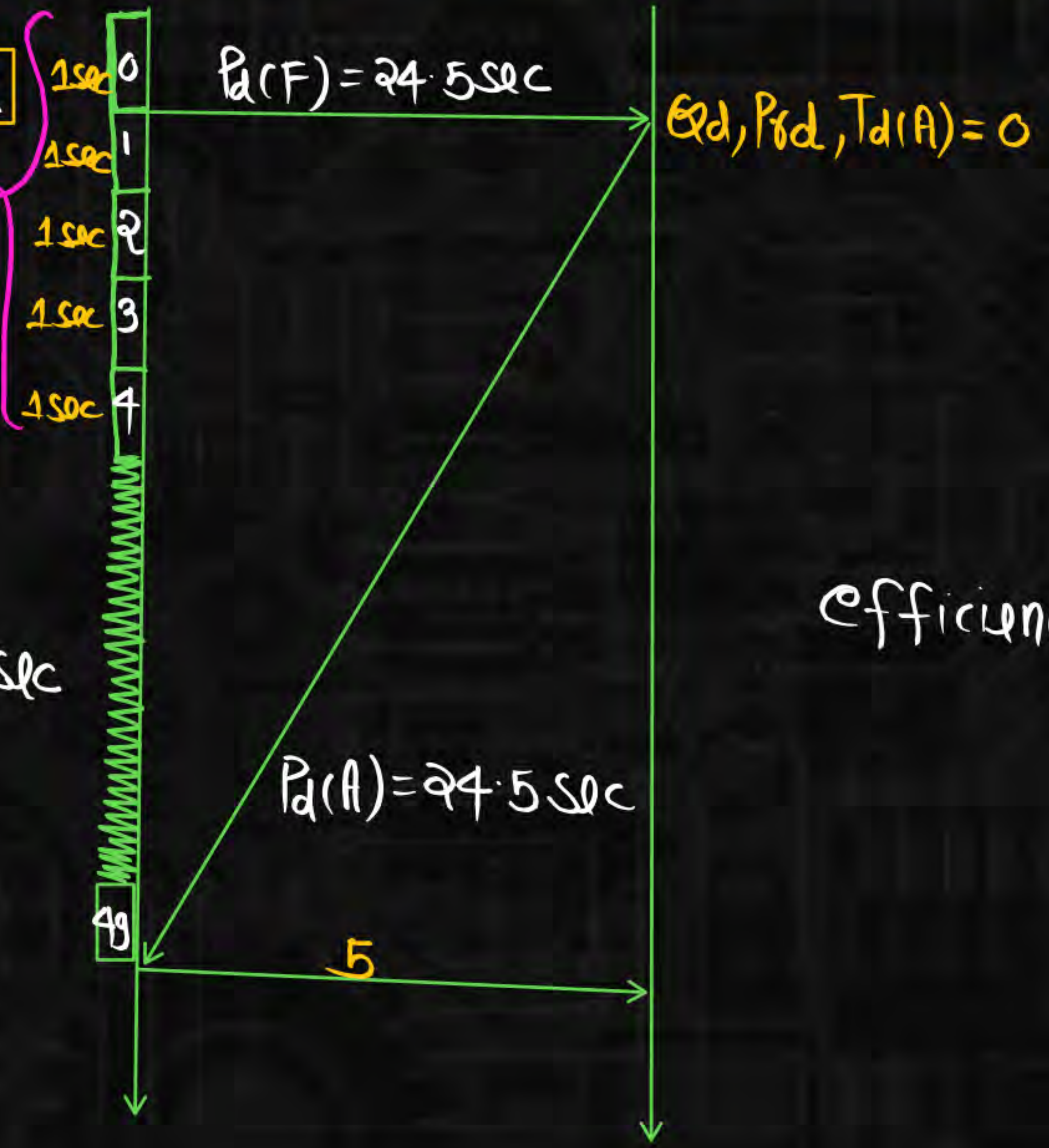
Q: $T_d(F) = 1\,sec$, $P_d = 24.5\,sec$, $Q_d = 0$, $Pr_d = 0$, $T_d(A) = 0$, GB-5, Seq No = 6 (0-5)

5 | 4 3 2 1 $\cancel{0}$

Ws=5

useFull time = 5 sec

Waiting time = 45 sec



$$\text{efficiency} = \frac{5}{50}$$

$$\text{efficiency} = \frac{1}{10}$$

$$\boxed{\text{efficiency} = 10\%}$$

$$\text{efficiency} = \frac{\text{useFul time}}{\text{total time}}$$

$$= \frac{\text{useFul time}}{\text{useFul time} + \text{waiting time}}$$

$$= \frac{5\,sec}{5\,sec + 45\,sec} = \frac{5}{50} = \frac{1}{10} = 10\%$$

$$\text{efficiency} = \frac{\text{useful time}}{\text{total time}}$$

$$\boxed{\text{efficiency} = \frac{N * T_d(F)}{T_d(F) + 2 * P_d + Q_d + P_{rd} + T_d(A)}}$$

exact Formula

$$\text{efficiency} = \frac{5 * 1\,\text{sec}}{1\,\text{sec} + 2 * 24.5 + 0 + 0 + 0}$$

$$\boxed{\text{efficiency} = \frac{5}{50} = \frac{1}{10} = 10\,\%}$$

$$\eta = \frac{N * T_d(F)}{T_d(F) + 2 * P_d + \cancel{Q_d} + \cancel{P_{rd}} + \cancel{T_d(A)}}$$

$$\eta = \frac{N * \cancel{T_d(F)}}{\cancel{T_d(F)}\left[1 + 2 * \frac{P_d}{T_d(F)}\right]}$$

$$\boxed{\eta = \frac{N}{1+2a}}$$

Approximate Formula

$$\frac{P_d}{T_d} = a$$

(I) If $N = (1+2a)$

$$\eta = \frac{\cancel{(1+2a)}}{\cancel{(1+2a)}}$$

$\eta = 1$, $\eta = 100$

(II) If $N > (1+2a)$

Q. $\eta = \frac{1}{10}$, B = 40 mbps, Throughput = ?

$$\text{Throughput} = \frac{1}{\cancel{10}} * \cancel{40}\,\text{mbps} = 4\,\text{mbps}$$

$$\boxed{\text{Throughput} = \text{efficiency} * \text{Bandwidth}}$$

$$\text{efficiency} = \frac{\text{Throughput}}{\text{Bandwidth}}$$

$$= \frac{4\,\cancel{\text{mbps}}}{40\,\cancel{\text{mbps}}}$$

$$\text{efficiency} = \frac{1}{10} = 10\%$$

$$\boxed{\text{Throughput} = \frac{N * \text{Frame size}}{\text{total time}}}$$


THANK YOU
GW
SOLDIERS !