CS & IT ENGINEERING

Computer Network

1500 Series

Lecture No.- 01

By- Ankit Doyla Sir

Recap of Previous Lecture

Topic One topic

Topic Two topic

Topics to be Covered

Topic — IPv4 Addressing

Topic — Subnetting

Topic — Supernetting

[MCQ]

#Q. Suppose ISP assigned a IP address with subnet mask 200.200.200.0/24 to an org-A. Now org-A wants to create a subnets of different number of addresses in each subnet. Which one of the following assignment is NOT possible?

A. 100, 50, 20, 25

B. 60, 60, 60, 25, 10, 14

C. 40, 40, 40, 20, 20, 10, 10

D. 100, 60, 20, 10, 14

200.200.200.0/24

NID = 24 bit, HID = 32 - 24 = 8 bit

No. of IP addresses possible = 2^8

$\frac{2^8}{4} = 2^{8-2} = 2^6$

(a)

(c)

(Not Possible)

[MCQ]

#Q. Suppose an organization wants to create sub-network containing 35,25,10 hosts in each sub-networks. What is the maximum length of subnet mask that organization should use?

A /22

B /24

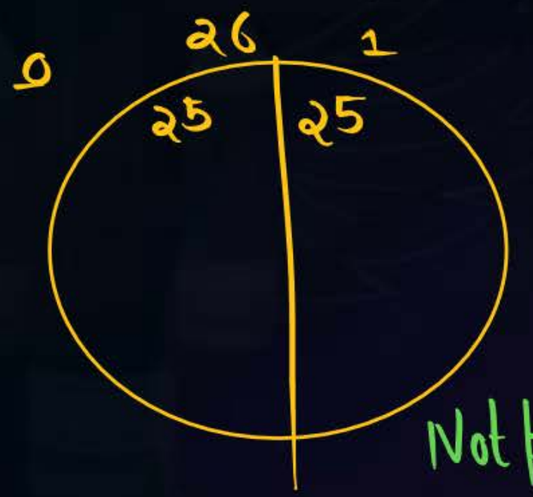
C /25

D /26

/26

NID = 26 bit, HID = 32-26 = 6 bit

No of IP Add possible = 2^6



Not possible

/25

NID = 25 bit, HID = 32 - 25 = 7 bit

No. of IP Add = 2^7

[MCQ]

#Q. You are a network administrator and have been assigned the Class C IP address of 201.222.5.0. The subnet mask 255.255.255.248 is used. What is the address of the 4th host of 4th subnet?

A 201.222.5.58

B 201.222.5.18

C 201.222.5.28

D 201.222.5.38

ADRule: २५५·२५५·२५५·11111000
NID SID HID

२०१·२२२·5·----- ---
NID SID HID

२०१·२२२·5·00011100 → २०१·२२२·5·२४

[MCQ]

#Q. A large organization with a large block address (12.44.184.0/21) is split into one medium-size company using the block address (12.44.184.0/22) and two small organizations. If the first small company uses the block (12.44.188.0/23), what is the remaining block that can be used by the second small company?

A. 12.44.184.0/22

B. 12.44.190.0/22

C. 12.44.190.0/23

D. None of the above

12.44.184.0/21

NID = 21 bit, HID = 32 - 21 = 11 bit

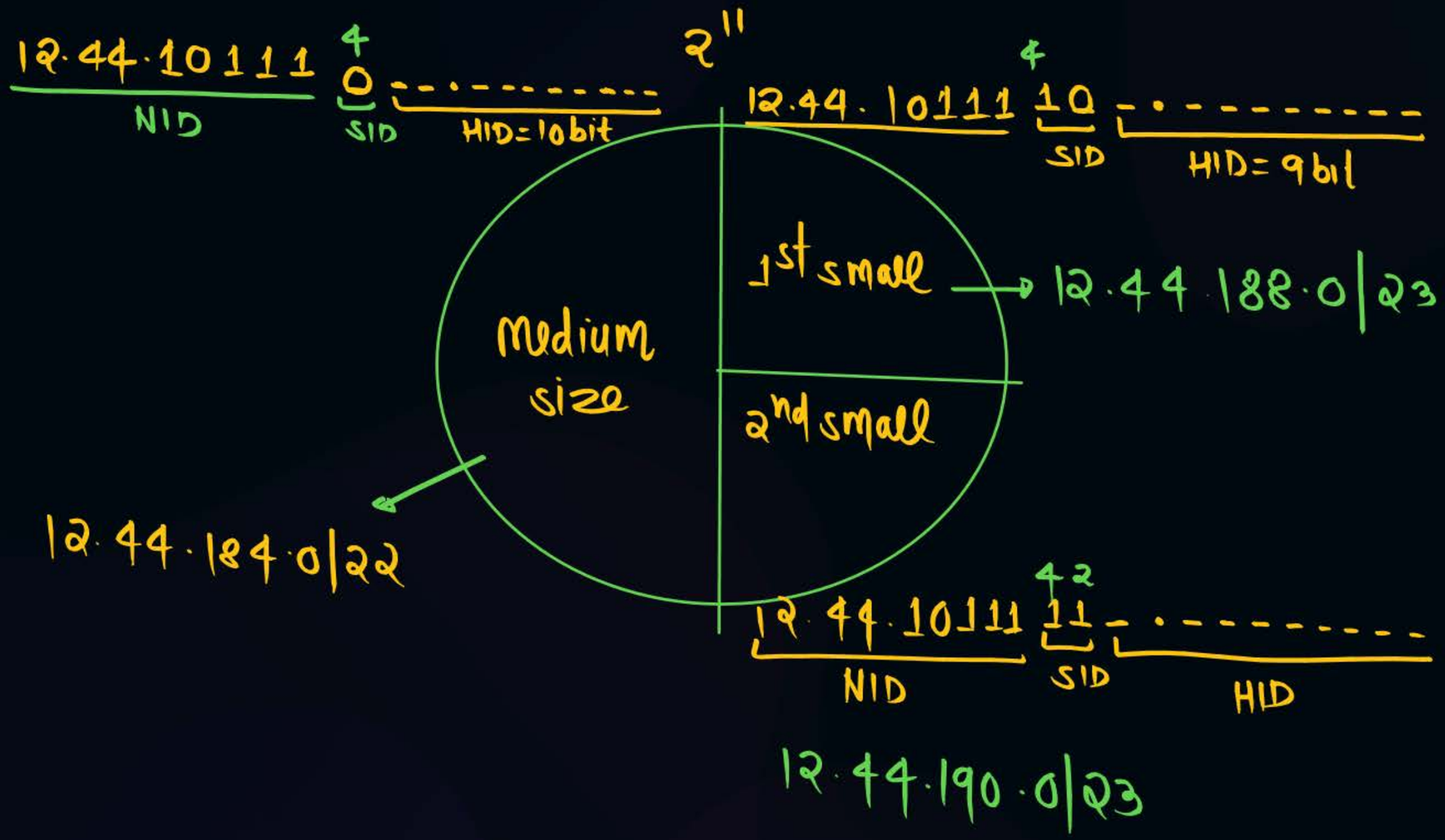
12.44.10111000.00000000

8+8+5

NID | HID

12.44.10111 ---.--------

HID


12.44.10111
4
0
NID
SID
HID=10bit
2^11
12.44.10111
4
10
SID
HID=9bit
1st small
12.44.188.0/23
Medium size
2nd small
12.44.184.0/22
4
2
12.44.10111
11
NID
SID
HID
12.44.190.0/23

[MCQ]

NID = 24 bit, HID = 32 - 24 = 8 bit

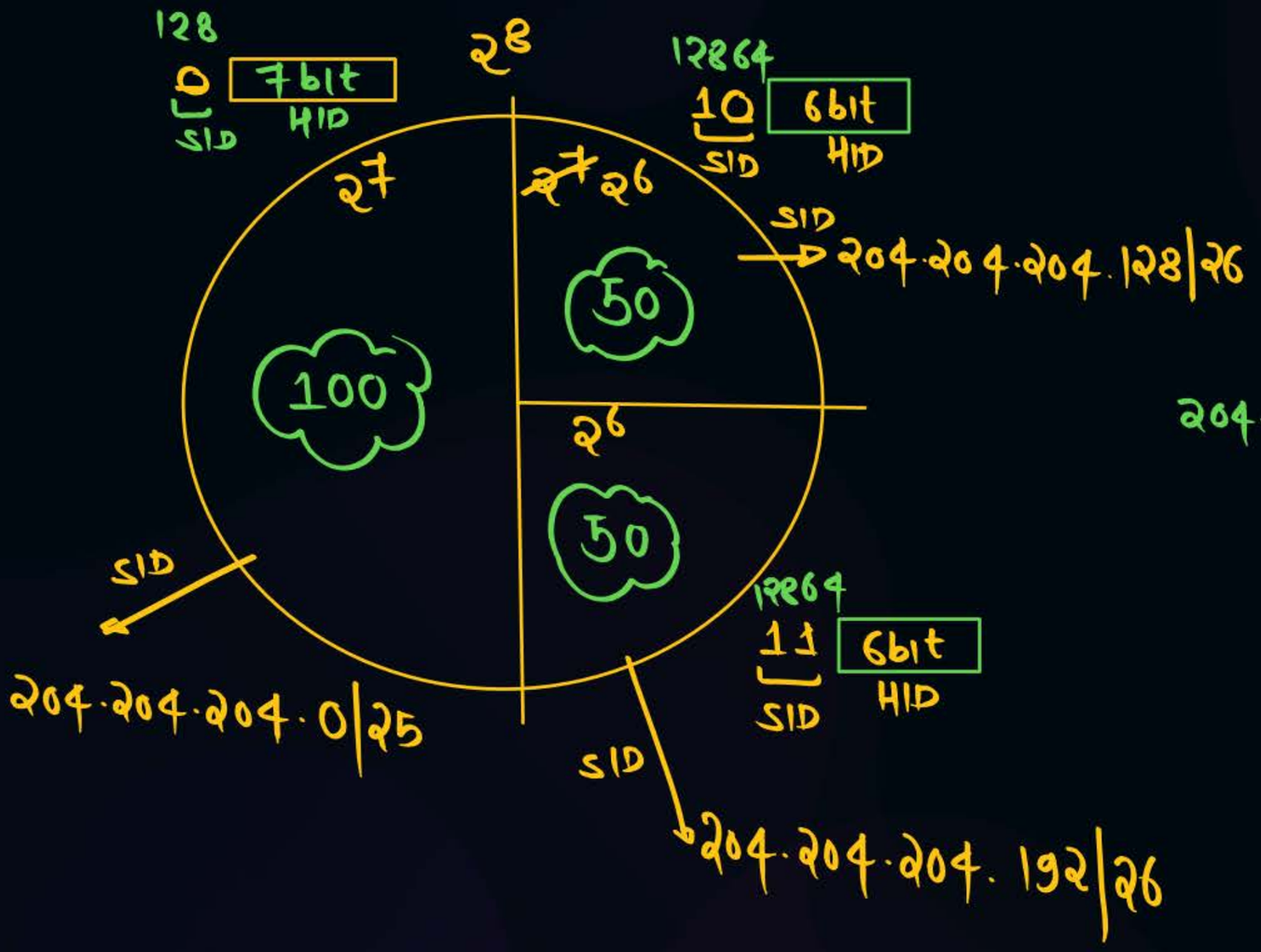
#Q. A company has a network address of 204.204.204.0/24. It wishes to have three subnets, one with 100 hosts and two with 50 hosts each. Which one of the following options represents a feasible set of subnet address?

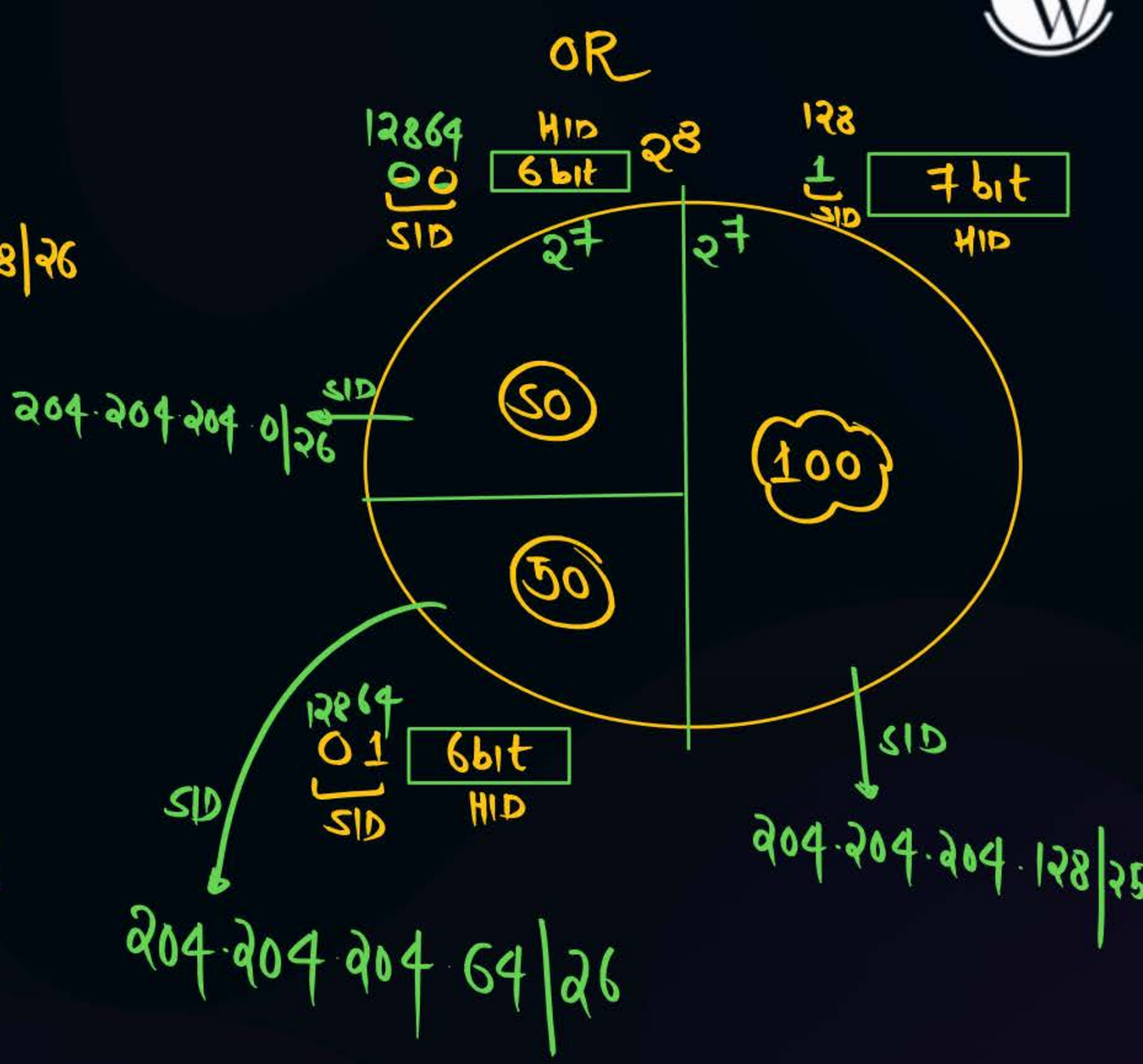
A. 204.204.204.128/26; 204.204.204.0/25; 204.204.204.64/25

B. 204.204.204.0/26; 204.204.204.192/25; 204.204.204.64/25

C. 204.204.204.128/25; 204.204.204.192/26; 204.204.204.224/26

D. 204.204.204.128/25; 204.204.204.64/26; 204.204.204.0/26


128
0
SID
7 bit
HID
2⁸
128 64
10
SID
6 bit
HID
2⁷
2⁷ 2⁶
SID
204.204.204.128/26
50
100
2⁶
50
SID
204.204.204.0/25
128 64
11
SID
6 bit
HID
SID
204.204.204.192/26


OR
128 64
00
SID
HID
6 bit
2⁸
128
1
SID
7 bit
HID
2⁷
2⁷
SID
204.204.204.0/26
50
100
50
128 64
01
SID
6 bit
HID
SID
204.204.204.64/26
SID
204.204.204.128/25

[MCQ]

#Q. An ISP is granted a block of addresses starting with 148.40.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows:

a. The first group has 200 large-size companies; each needs approximately 128 addresses.

b. The second group has 400 Medium-size companies; each needs approximately 16 addresses.

c. The third group has 2000 Small-size companies ; each needs 4 addresses.

The prefix length (number of 1's in the subnet mask) for first, second and third group respectively is

A 17, 19, 19

B 25, 25, 25

C 25, 26, 27

D 25, 28, 30

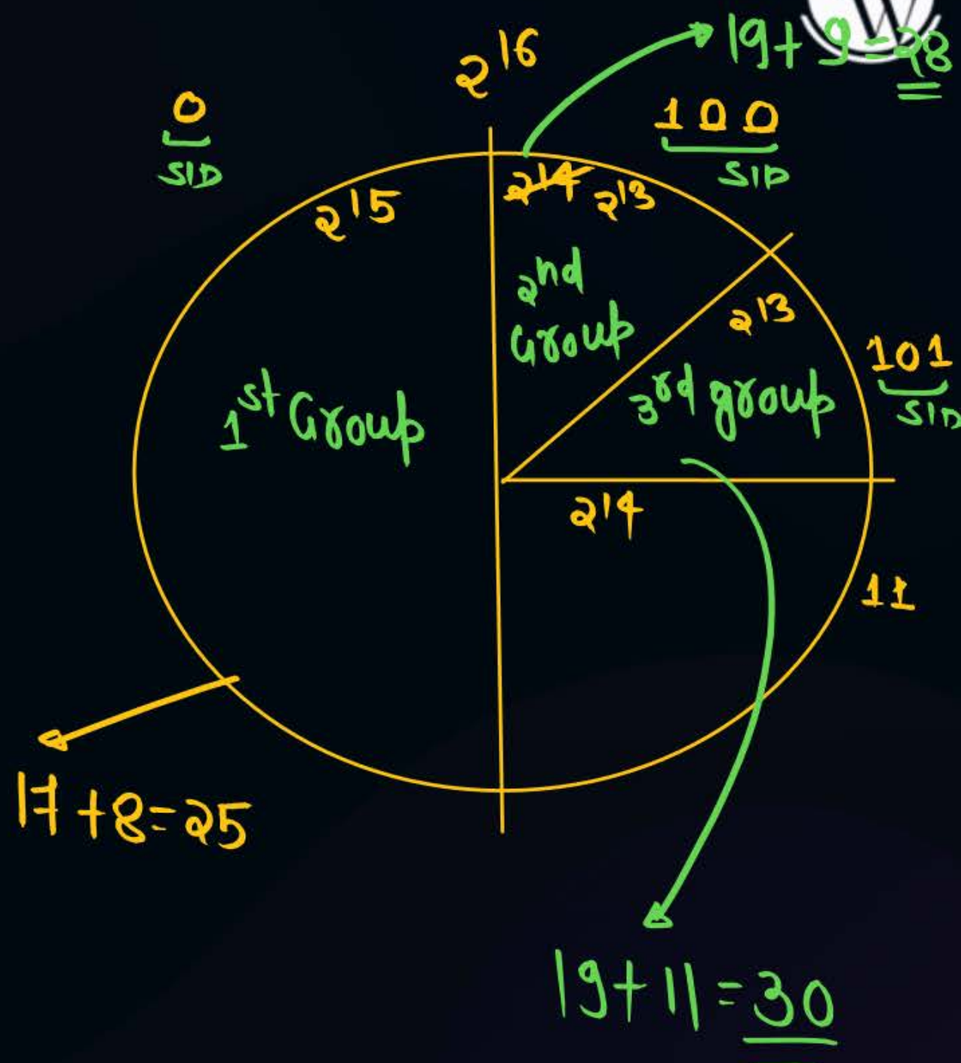
1st Group: 200 * 128 Addresses = $2^8 * 2^7 = 2^{15}$

2nd Group: 400 * 16 Addresses = $2^9 * 2^4 = 2^{13}$

3rd Group: 2000 * 4 Addresses = $2^{11} * 2^2 = 2^{13}$

148.40.0.0/16, NID = 16 bit, HID = 16 bit

No. of IP Addresses = 2^{16}



1st Group:

148.16.0 ---------- (SID)

148.16.0.0000000.00000000 → 148.40.0.0/17

⋮

148.16.0.1111111.11111111 → 148.40.127.255/17

148.40.0.0/17

NID = 17 bit, HID = 15 bit

NID	HID
17	15

200 Companies or 200 subnet

17	8	7
NID	SID	HID

Ans: 17+8 = 25 (NID) OR $32 - 7^{HID} = 25$

[MCQ]

#Q. An ISP is granted a block of addresses starting with 190.100.0.0/16. The ISP needs to distribute these addresses to four groups of customers as follows:

a. The first group has 128 customers; each need 256 addresses.

b. The second group has 128 customers; each need 128 addresses

c. The third group has 128 customers; each need 64 addresses.

d. The fourth group has 128 customers; each need 32 addresses.

Which of the following is the more accurate prefix length of all four groups respectively?

A 24,25,26,26

B 25,25,25,25

C 24,25,26,27

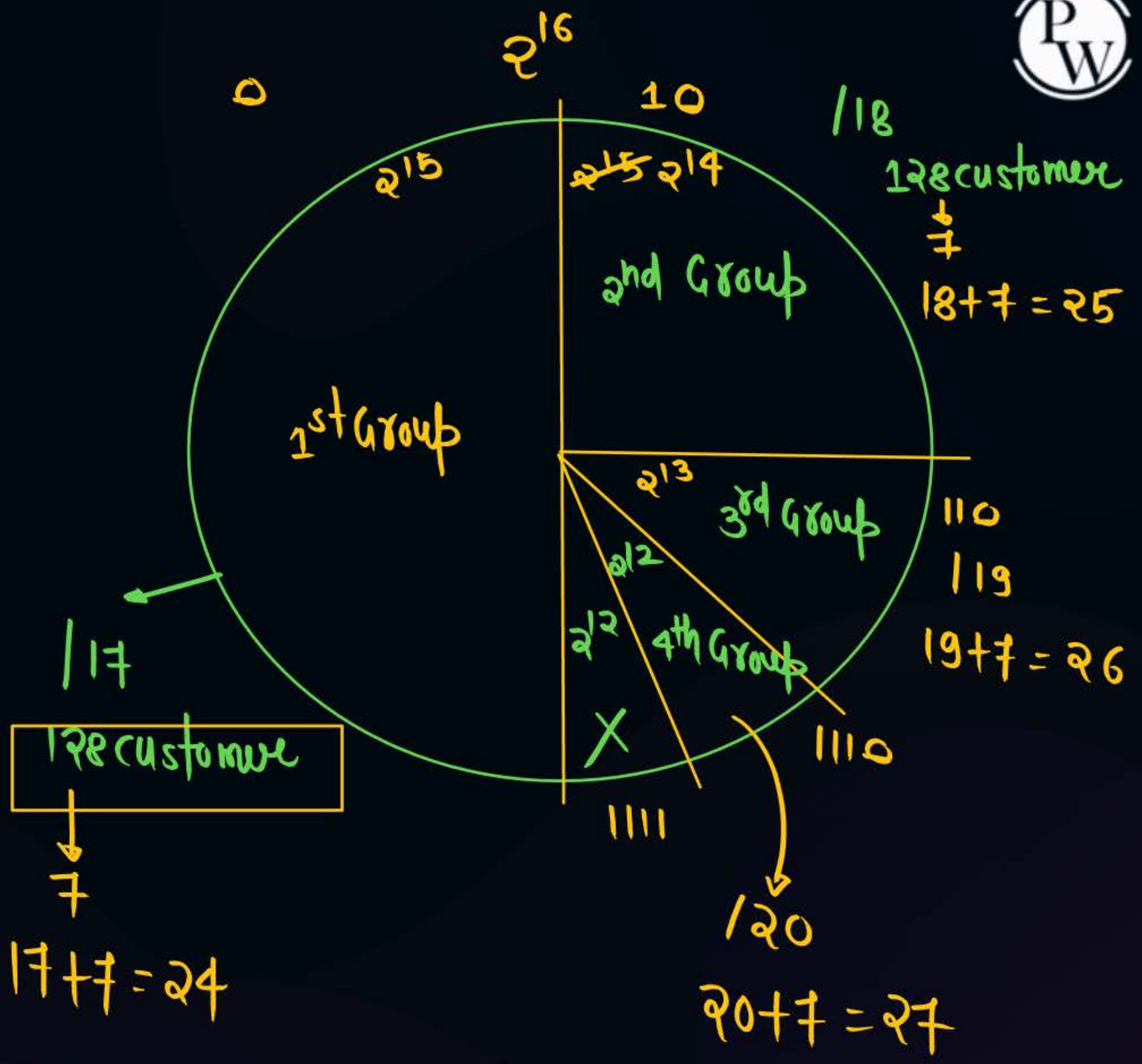
D 23,24,25,26

1st Group = 128 * 256 = $2^7 * 2^8 = 2^{15}$

2nd Group = 128 * 128 = $2^7 * 2^7 = 2^{14}$

3rd Group = 128 * 64 = $2^7 * 2^6 = 2^{13}$

4th Group = 128 * 32 = $2^7 * 2^5 = 2^{12}$



[MCQ]

#Q. An organization has the following routing prefix: 142.37.22.0/23. It is required to have 4 subnets in organization, one subnets has 210 hosts and the 3 other subnets has 55 hosts each. What are the 4 subnet network addresses and their corresponding prefixes?

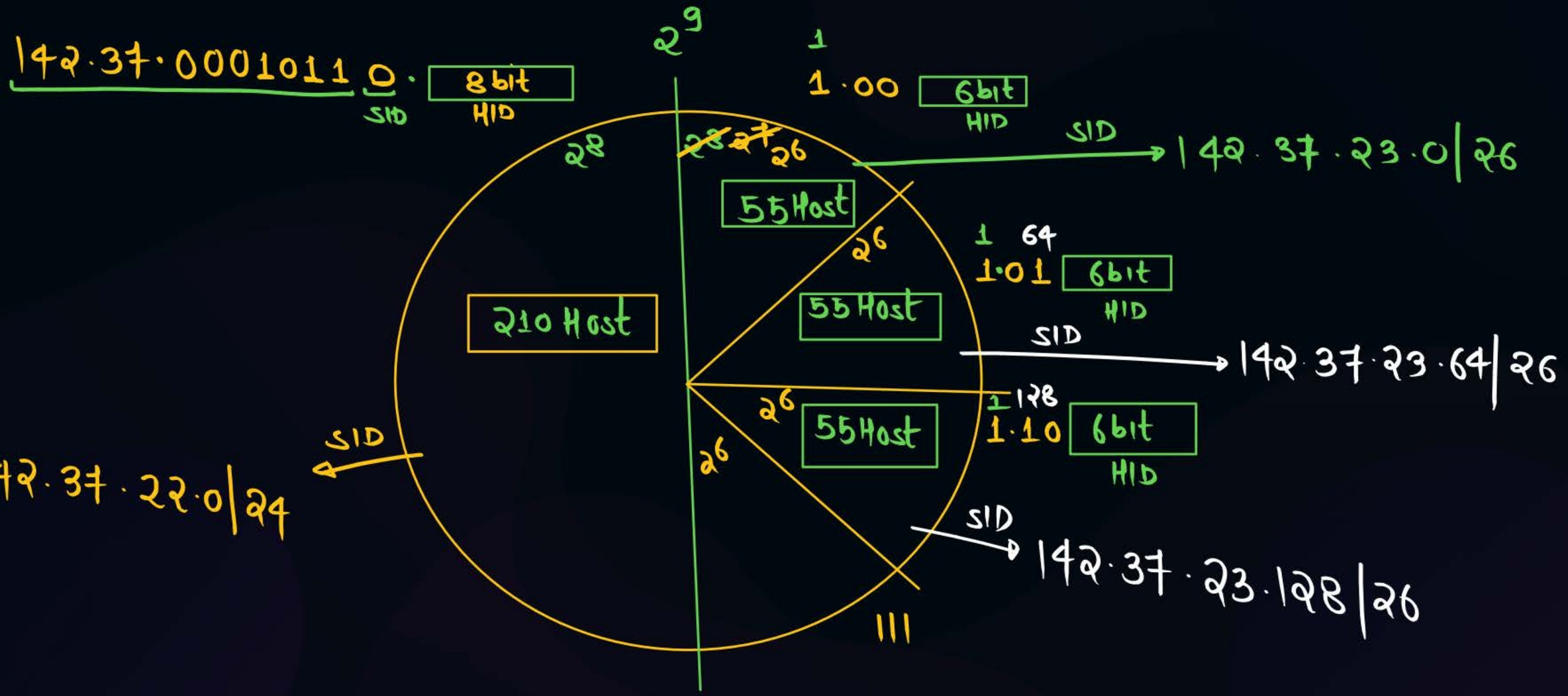
A. 142.37.22.0/24, 142.37.22.0/26, 142.37.23.64/26, 142.37.23.128/26

B. 142.37.22.0/24, 142.37.23.0/26, 142.37.23.64/26, 142.37.23.128/26

C. 142.37.22.0/24, 142.37.23.0/25, 142.37.23.64/26, 142.37.23.128/27

D. 142.37.22.0/24, 142.37.22.0/26, 142.37.22.64/26, 142.37.22.128/26

142.37.22.0/23, NID = 23 bit
HID = 9 bit



[MCQ]

#Q. Consider the following four IP addresses:

212.56.146.0/24 , HID = 8

212.56.147.0/24 , HID = 8

212.56.148.0/24 , HID = 8

212.56.149.0/24 , HID = 8

The single CIDR aggregation of the above four IP addresses is

A 212.56.146.0/21

B 212.56.146.0/22

C 212.56.146.0/23

D Not possible to perform in single aggregation

① Contiguous (True)

② same size = 2^3 & No. of N/W = $4 = 2^2$

③ 1st NID must be div by total size of supernet

Total size of subnet $= 2^8 + 2^8 + 2^8 + 2^8$

$= 2^{10}$

212.56.10010010.00000000 | 2^{10} (False bcz Rem is Non zero)

Rem or HID

[MSQ]

#Q. An ISP has the following CIDR based IP-address available with it:

200.200.128.0/20.

The ISP wants to give half of this IP-address to Org-A and quarter to Org-B. If first IP-Address will be assigned to a network which consumes more number of IP-address, then what is possible value of 3rd octed of Org-B_____?

H.W

A 136

B 140

C 128

D 132

[MCQ]

#Q. Which one of the following hosts in any subnet of 192.168.32.0 is not valid. Assume the subnet mask used is 255.255.255.240

A 192.168.32.33

B 192.168.32.112

C 192.168.32.119

D 192.168.32.126

H·W

2 mins Summary

Topic One — IPv4 Addressing

Topic Two — Subnetting

Topic Three — Supernetting

Topic Four

Topic Five

THANK - YOU

Error control

CS & IT ENGINEERING

Computer Network

1500 Series

Lecture No.- 02

By- Ankit Doyla Sir

Recap of Previous Lecture

Topic One topic IP Addressing

Topic Two topic Subnetting, Supernetting

Topics to be Covered

Topic — Error control

Topic — CRC, Checksum, Hamming Code

[MSQ]

#Q. An ISP has the following CIDR based IP-address available with it:

200.200.128.0/20.

The ISP wants to give half of this IP-address to Org-A and quarter to Org-B. If first IP-Address will be assigned to a network which consumes more number of IP-address, then what is possible value of 3rd octed of Org-B_____?

A 136

B 140

C 128

D 132

200.200.128.0/20

NID = 20 bit, HID = 32 - 20 = 12 bit

No. of IP Addresses possible = 2^{12}

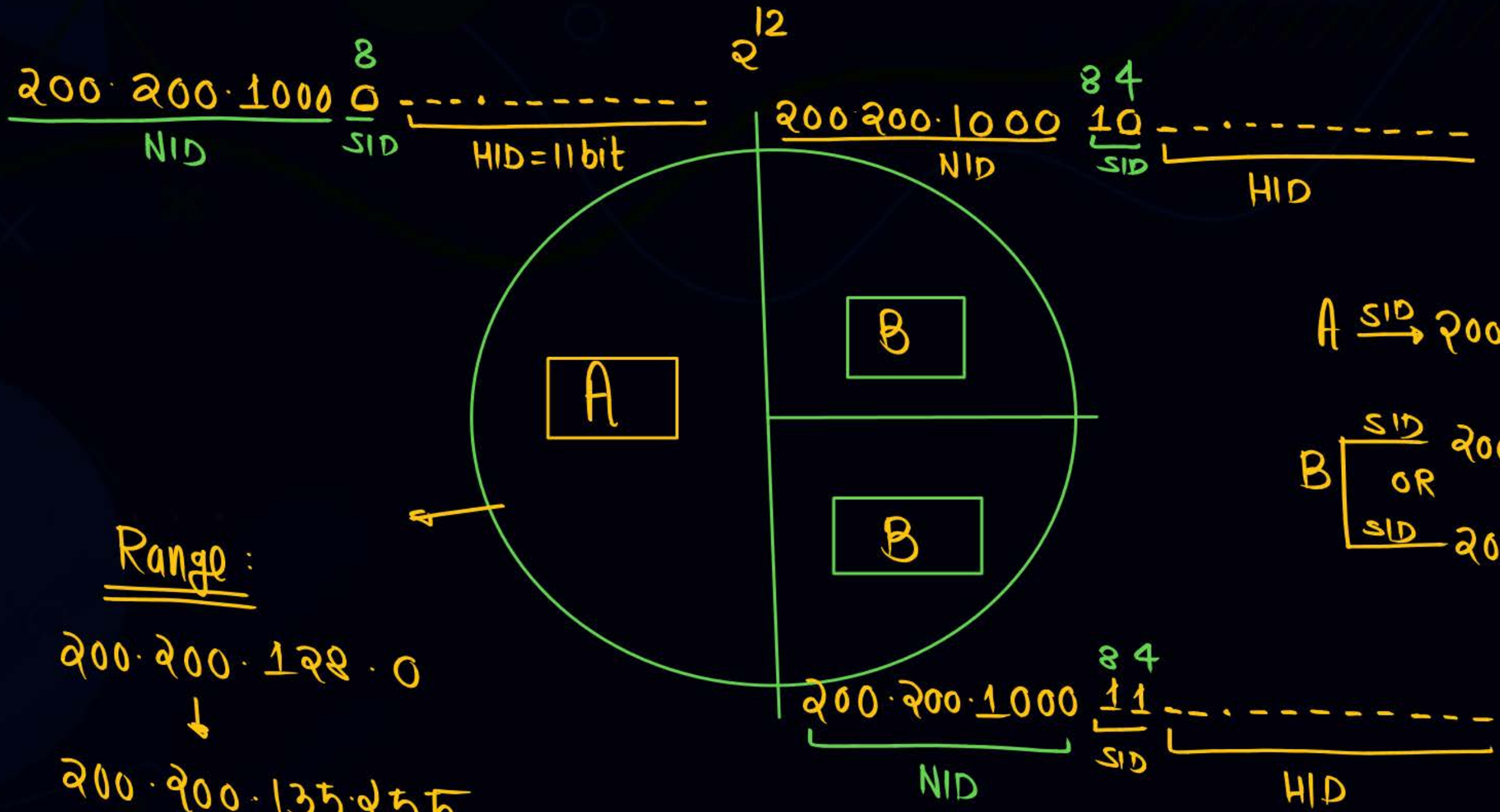
200.200.1000|0000.00000000

8 + 8 + 4 | HID

NID

200.200.1000.----------

HID



A SID → 200.200.128.0

B SID → 200.200.136.0
B SID → 200.200.140.0

Range :

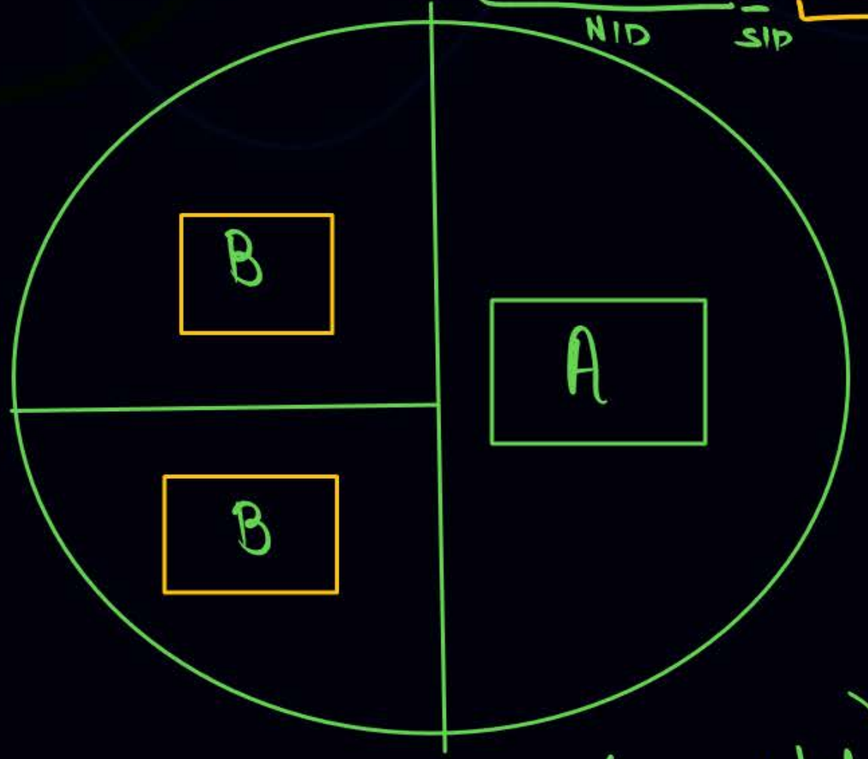
200.200.128.0
↓
200.200.135.255

OR

00

2^{12} 200.200.10001 8

NID SID HID



01

Range

200.200.136.0

↓

200.200.143.255

(Invalid)

128
15
143

#Q. Checksum value of 1001001110010011 and 1001100001001101 of 16 bit segment is-

A 0010101000011111

B 1100111100100101

C 1101010000011110

D 1101010000011111

[MCQ]

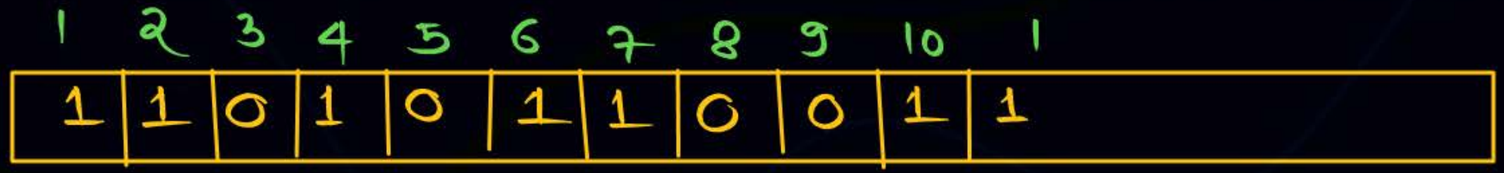
#Q. The Hamming codeword 11010110011 is received by receiver. For this codeword, the Hamming code(even parity) check at the receiver indicates that:

A. There is an error in the third bit transmitted

B. There is an error in the fourth bit transmitted

C. There is an error in the seventh bit transmitted

D. There is no error, codeword is accepted by receiver



P_1

1 3 5 7 9 11

1 0 0 1 0 1 → odd ($P_1 = 1$)

P_2

2 3 6 7 10 11

1 0 1 1 1 1 → odd ($P_2 = 1$)

P_4

4 5 6 7

1 0 1 1 → odd ($P_4 = 1$)

P_8

8 9 10 11

0 0 1 1 → even ($P_8 = 0$)

P_8	P_4	P_2	P_1	
0	1	1	1	→ 7th bit got corrupted

[MCQ]

14 4 15

#Q. A 12-bit Hamming code whose hexadecimal value is 0xE4F arrives at a receiver. What was the original value in hexadecimal? Assume that not more than 1 bit in error. If we are using every parity.

A E4F

B C4F

C D4F

D A4F

1	2	3	4	5	6	7	8	9	10	11	12
1	1	1	0	0	1	0	0	1	1	1	1
1	0	1	0	0	1	0	0	1	1	1	1
			A				4				F

Original msg = A4F

P_1

1	3	5	7	9	11
1	1	0	0	1	1 → even (P_1=0)

P_2

2	3	6	7	10	11
1	1	1	0	1	1 → odd (P_2=1)

P_4

4	5	6	7	12
0	0	1	0	1 → even (P_4=0)

P_8

8	9	10	11	12
0	1	1	1	1 → even (P_8=0)

P_8	P_4	P_2	P_1	
0	0	1	0	→ 2nd bit (Error)

[MCQ]

#Q. Assume that a 12-bit hamming codeword consisting of 8 bit data = 110×0101 and check bits = y000, what are the value of x and y if data in encoded using even parity?

A. x = 0, y = 0

B. x = 0, y = 1

C. x = 1, y = 0

D. x = 1, y = 1

P_1	P_2	3	P_4	5	6	7	P_8	9	10	11	12
y	0	1	0	1	0	X	0	0	1	0	1

P_1

1 3 5 7 9 11

y 1 1 X 0 0

0 1 1 0 0 0 (Y=0 For even parity)

P_2

2 3 6 7 10 11

0 1 0 X 1 0

0 1 0 0 1 0 → even

P_4

4 5 6 7 12

0 1 0 X 1 (X=0 For even parity)

P_8

8 9 10 11 12

0 0 1 0 1 → even

[MCQ]

#Q. The codeword c(x) = x9 + x 6 + x5 + x3 + x + 1 has arrived on a network link where the sender and receiver are using CRC with the generator polynomial g(x) = x3 + x2 + 1. For this particular transmission, the CRC check at the receiver indicates that:

A there is an error in the fourth bit transmitted

B there is an error in the fifth bit transmitted

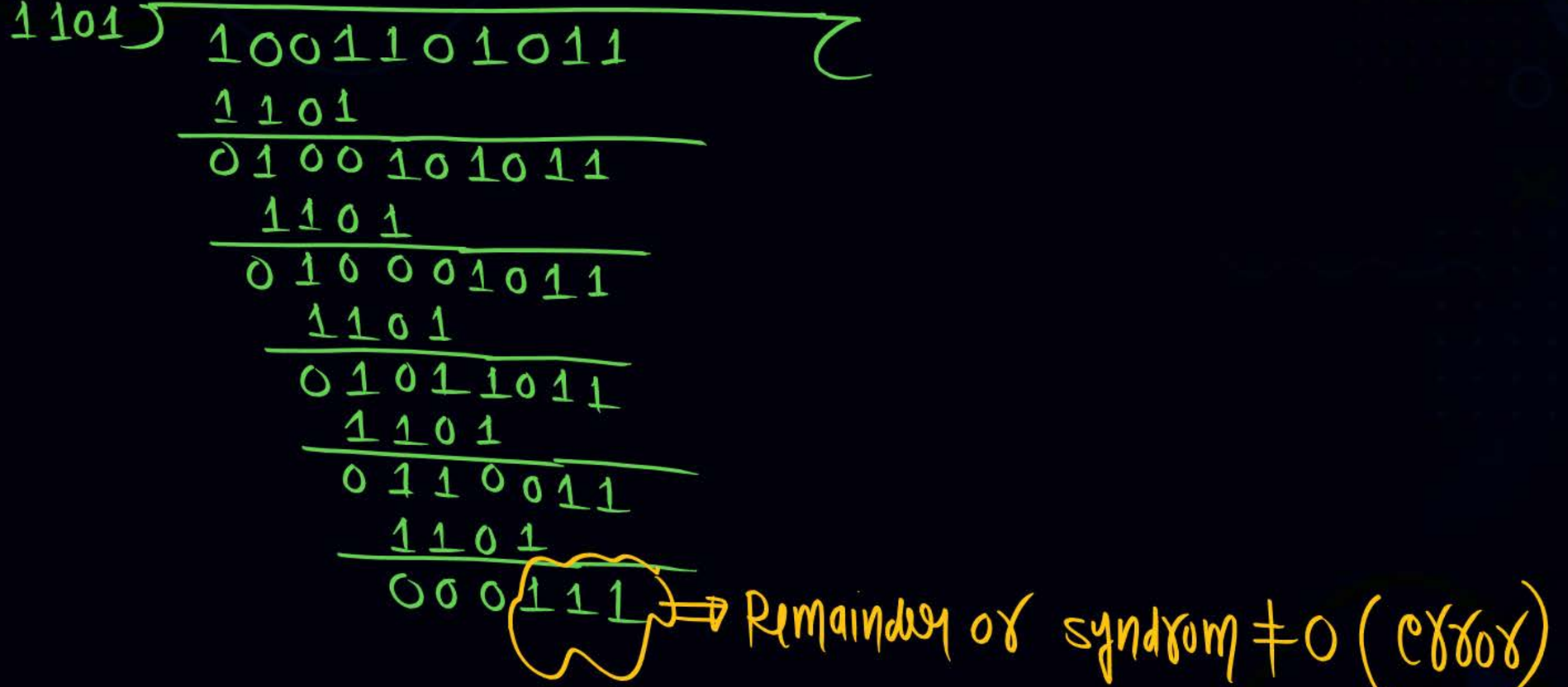
C there is an error, but we cannot say about which bit contains error

D There is no error, codeword is accepted by receiver.

$c(x) = 1001101011$

$g(x) = 1101$

Receiver



2 mins Summary

Topic One

Topic Two

Topic Three

Topic Four

Topic Five

Error control

CRC, Checksum, Hamming Code

THANK - YOU

CS & IT ENGINEERING

Computer Network

1500 Series

Lecture No.- 03

By- Ankit Doyla Sir

Recap of Previous Lecture

Topic One topic

Topic Two topic

Topics to be Covered

- Topic
- Topic

Flow control

[NAT]

#Q. Consider an error-free 64-kbps satellite channel used to send 512-byte data frames in one direction, with very short acknowledgements coming back the other way. What is the maximum throughput(in Kbps) for window sizes of 15. The earth-satellite propagation time is 270 msec. Ans: 64

$B = 64 * 10^3$ bits/sec

$P_d = 270$ msec

Frame size = 512 Byte

$= 512 * 8$ bits

$$T_{d(Frame)} = \frac{\text{Frame size}}{\text{Bandwidth}} = \frac{512 * 8 \text{ bits}}{64 * 10^3 \text{ bits/sec}} = 64 * 10^{-3} \text{ sec} = 64 \text{ msec}$$

64

8

$$\text{Throughput} = \frac{W_s * \text{Framesize}}{\text{Total time}}$$

$$= \frac{15 \times 512 * 8 \text{ bits}}{T_d(F) + 2 * P_d + Q_d + P_{ack} + T_d(ft)}$$

$Q_d \to 0$, $P_{ack} \to 0$, $T_d(ft) \to 0$

$$= \frac{15 * 512 * 8 \text{ bits}}{64\text{msec} + 2 * 270\text{msec}}$$

$$= \frac{15 * 512 * 8 \text{ bits}}{604 * 10^{-3} \text{ sec}}$$

$$= 101.71 * 10^3 \text{ bits/sec}$$

$$= 101.71 \text{ KbPs}$$

Throughput can not greater than Bandwidth so

maximum throughput = 64KbPs

$$\text{Throughput} = \eta * B$$

$$\text{Throughput} = 1 * B$$

$$\boxed{\text{Throughput} = B}$$

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

$$1 = \frac{W_s * T_d(F)}{T_d(F) + 2 * P_d}$$

$$\frac{1}{1} = \frac{W_s * 64}{64 + 2 * 270}$$

$$W_s = \frac{604}{64}$$

$$W_s = 9.43 \simeq \underline{\underline{10}}$$

[MSQ]

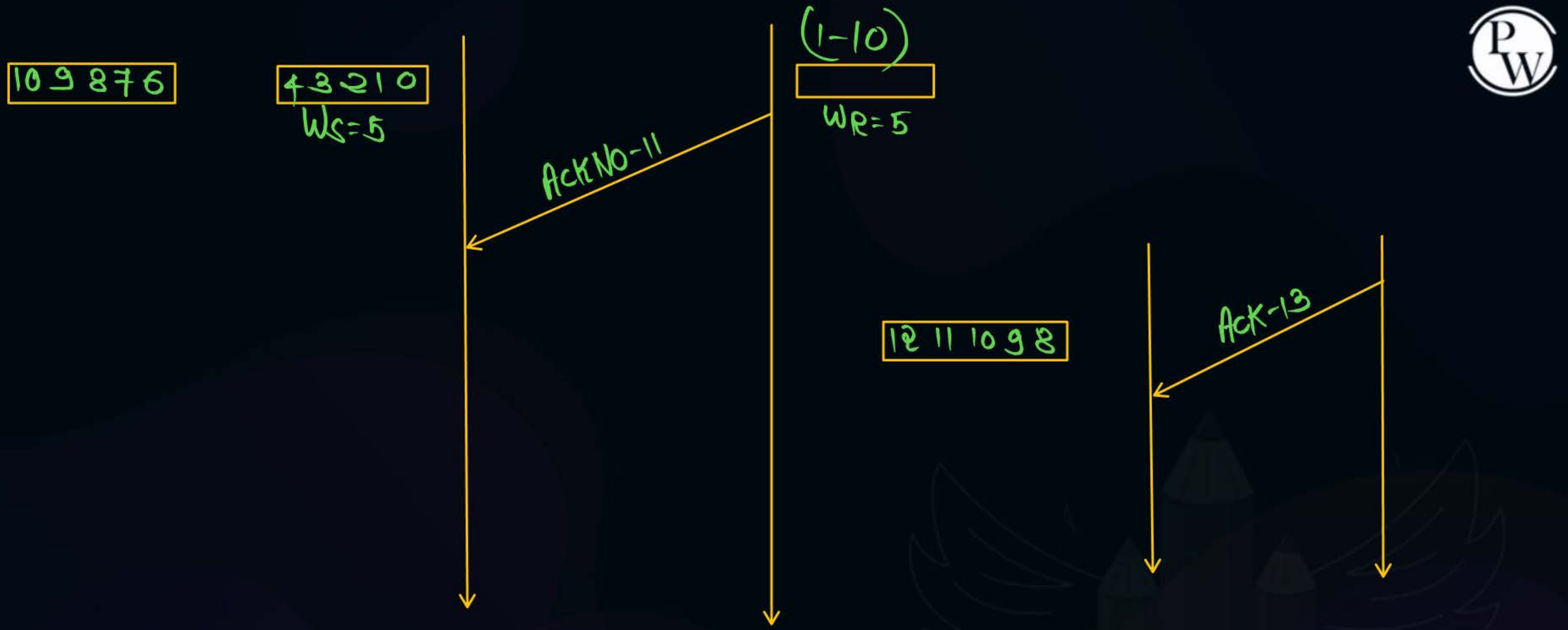
#Q. In a sliding window protocol with RWS = SWS =5, a very large set of possible sequence numbers (assume no wrapping), and in-order packet arrivals,) [redacted], and in-order packet arrivals, which of the following scenario is possible?

A. The receiver can receive, frame number 5 if currently expecting frame is 11.

B. The receiver can receive, frame number 6 if currently expecting frame is 11.

C. The receiver can receive, frame number 7, if currently expecting frame is 13.

D. The receiver can receive, frame number 8, if currently expecting frame is 13


10 9 8 7 6
4 3 2 1 0
WS=5
(1-10)
WR=5
ACKNO-11
12 11 10 9 8
ACK-13

[MCQ]

#Q. The distance from earth to a distant planet is approximately 9×10^{10}m. What is the channel utilization if a stop -and-wait protocol is used for frame transmission on a 64 Mbps point-to-point link?

Assume that the frame size is 32KB and the speed of light is 3×10^8 m/sec. Calculate the efficiency in percentage.

A 6.8266×10^{-6}

B 5.8266×10^{-6}

C 4.8266×10^{-6}

D 6.8266×10^{-4}

$d = 9 * 10^{10}$ m

$B = 64 * 10^6$ bits/sec

Frame size = 32KB = $32 * 1024 * 8$ bits

$v = 3 * 10^8$ m/sec

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

$$P_d = \frac{3 * 10^{10}\ m}{3 * 10^{8}\ m/sec}$$

$$P_d = 3 * 10^{2}\ sec$$

$$P_d = 300\ sec$$

$$T_{d(F)} = \frac{\text{Frame size}}{\text{Bandwidth}}$$

$$= \frac{32 * 1024 * 8\ bits}{64 * 10^{6}\ bits/sec}$$

$$= 4096 * 10^{-6}\ sec$$

$$= 0.004096\ sec$$

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

$$\eta = \frac{T_{d(F)}}{T_{d(F)} + 2 * P_d}$$

$$\eta = \frac{0.004096}{0.004096 + 2 * 300}$$

$$\eta = \frac{0.004096\ sec}{600.004096\ sec}$$

$$\eta = 6.8266 * 10^{-6}$$

$$\eta = 6.8266 * 10^{-4}\ \%$$

[NAT]

(in Kbps)

#Q. What is the throughput of the system if it uses the Stop-and-Wait ARQ protocol for transmitting 1000 bytes frame with the bit rate of 40 Kbps. However the receiver can transmit 100 bytes acknowledgment with the rate of 8 Kbps. The system experience propagation delay of 50 milliseconds?

Frame size = 1000 Byte = 8000 bits

B = 40 Kbps

$$T_{d(F)} = \frac{\text{Frame size}}{\text{Bandwidth}}$$

$$= \frac{8000 \text{ bits}}{40 \times 10^3 \text{ bits/sec}}$$

$$= 200 \times 10^{-3} \text{ sec} = 200 \text{ msec}$$

Ack size = 100 Byte = 800 bits

B = 8 Kbps = 8×10^3 bits/sec

$$T_{d(A)} = \frac{\text{Ack size}}{\text{Bandwidth}} = \frac{800 \text{ bits}}{8 \times 10^3 \text{ bits/sec}}$$

$$= 100 \times 10^{-3} \text{ sec} = 100 \text{ msec}$$

P_d = 50 msec

$$\text{Throughput} = \frac{\text{Frame size}}{\text{Total time}}$$

$$= \frac{8000 \text{ bits}}{T_d(F) + 2 * P_d + \cancel{Q_d} + \cancel{P_{od}} + T_d(A)}$$

$$= \frac{8000 \text{ bits}}{200 + 2 * 50 + 100 \text{ msec}}$$

$$= \frac{\cancel{8000} \text{ bits}}{\cancel{400} * 10^{-3} \text{ sec}}$$

$$= 20 * 10^3 \text{ bits/sec}$$

$$= \underline{\underline{20 \text{ Kbps}}}$$

[NAT]

#Q. Suppose you are designing a sliding window protocol for a 1-Mbps point-to-point link to the stationary satellite revolving around the Earth at an altitude of 3×10^4 km. Assuming that each frame carries 1 KB of data, what is the minimum number of bits you need for the sequence number in the following cases?

Assume the speed of light is 3×10^8 m/s.

(a) RWS = 1 (GB-N)

(b) RWS = SWS (SR)

$B = 10^6$ bits/sec

$d = 3*10^4$ km

Frame size = 1 KB = 1024 Byte
$= 8*1024$ bits
$= 8192$ bits

$v = 3*10^8$ m/sec $= 3*10^5$ km/sec

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

$$P_d = \frac{3*10^8 \text{ km}}{3*10^5 \text{ km/sec}}$$

$$P_d = 0.1 \text{ sec}$$

$$T_d(F) = \frac{\text{Frame size}}{\text{Bandwidth}}$$

$$= \frac{8192 \text{ bits}}{10^6 \text{ bits/sec}}$$

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

$$= 0.008192$$

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

$$1 = \frac{N * T_d(F)}{T_d(F) + 2 * P_d}$$

$$N = \frac{T_d(F) + 2 * P_d}{T_d(F)}$$

$$N = \frac{0.008192 + 2 * 0.1}{0.008192}$$

$$N = \lceil 25.41 \rceil = 26$$

$N = 25$

$$= \frac{25 * 0.008192}{0.008192 + 2 * 0.1}$$

$$= 0.99$$

minimum sequence No. required in GBN = N+1 (IF N is Window sender size)

$= 26+1 = 27$

$27 = 2^K$

$2^5 = 2^K$

$K = 5$ bit

minimum seq. No. required in SR = $N+N = 2N = 2*26 = 52$

$2^K = 52$

$2^K = 2^6$

$K = 6$ bit

[NAT]

#Q. A 3000 km long trunk is used to transmit frames using Go-Back-N protocol. The propagation speed is 6 microsec/km and trunk data rate are 1.544 Mbps. The ack time is not considered. Frame size of 64 bytes. What is the maximum number of bits of sequence number also calculate the maximum window size at the sender size if 100% need to be achieved?

$d = 3000\ km$

Propagation time For 1 km $= 6\ \mu sec$

Propagation time For 3000 km $= 3000 * 6\ \mu sec$

$= 18000\ \mu sec$

$= 18000 * 10^{-6}\ sec$

$= 18 * 10^{-3}\ sec = 18\ msec$

$B = 1.544 * 10^6$ bits/sec

Frame size $= 64 * 8$ bits

$= 512$ bits

$T_d(F) = \frac{512\ bits}{1.544 * 10^6\ bits/sec}$

$= 331.6 \times 10^{-6}\ sec$

$= .33 * 10^{-3}\ sec = .33\ msec$

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

$$1 = \frac{N * T_d(F)}{T_d(F) + 2 * P_d}$$

$$N = \frac{T_d(F) + 2 * P_d}{T_d(F)}$$

$$N = \frac{\cdot 33 + 2 * 18}{\cdot 33}$$

$$N = \frac{36 \cdot 33}{\cdot 33}$$

$$N = 110 \cdot 09 \approx 111$$

min sequence No. required in GBN = 111 + 1 = 112

$$2^K = 112$$

$$2^K = 2^7$$

$$K = 7 \text{ bit}$$

[NAT]

#Q. Consider two hosts are connected with direct link having data transfer rate 10 Mbps and signal speed 3 ms per km, distance between them is 10 km and packet size is 5000 Bytes. The sequence number field in frame format is 4 bits long, and go back N ARQ protocol is used for flow control then the maximum amount of time that sender remain Idle (in ms) is __. (4 msec)

B = 10 mbps = $10 * 10^6$ bits/sec , d = 10 km

Propagation time For 1 km = 3 msec

Propagation time For 10 km = 10 * 3 msec = 30 msec

Packet size = 5000 Byte
= 40,000 bits

$T_d(F) = \frac{40{,}000 \text{ bits}}{10 * 10^6 \text{ bits/sec}}$

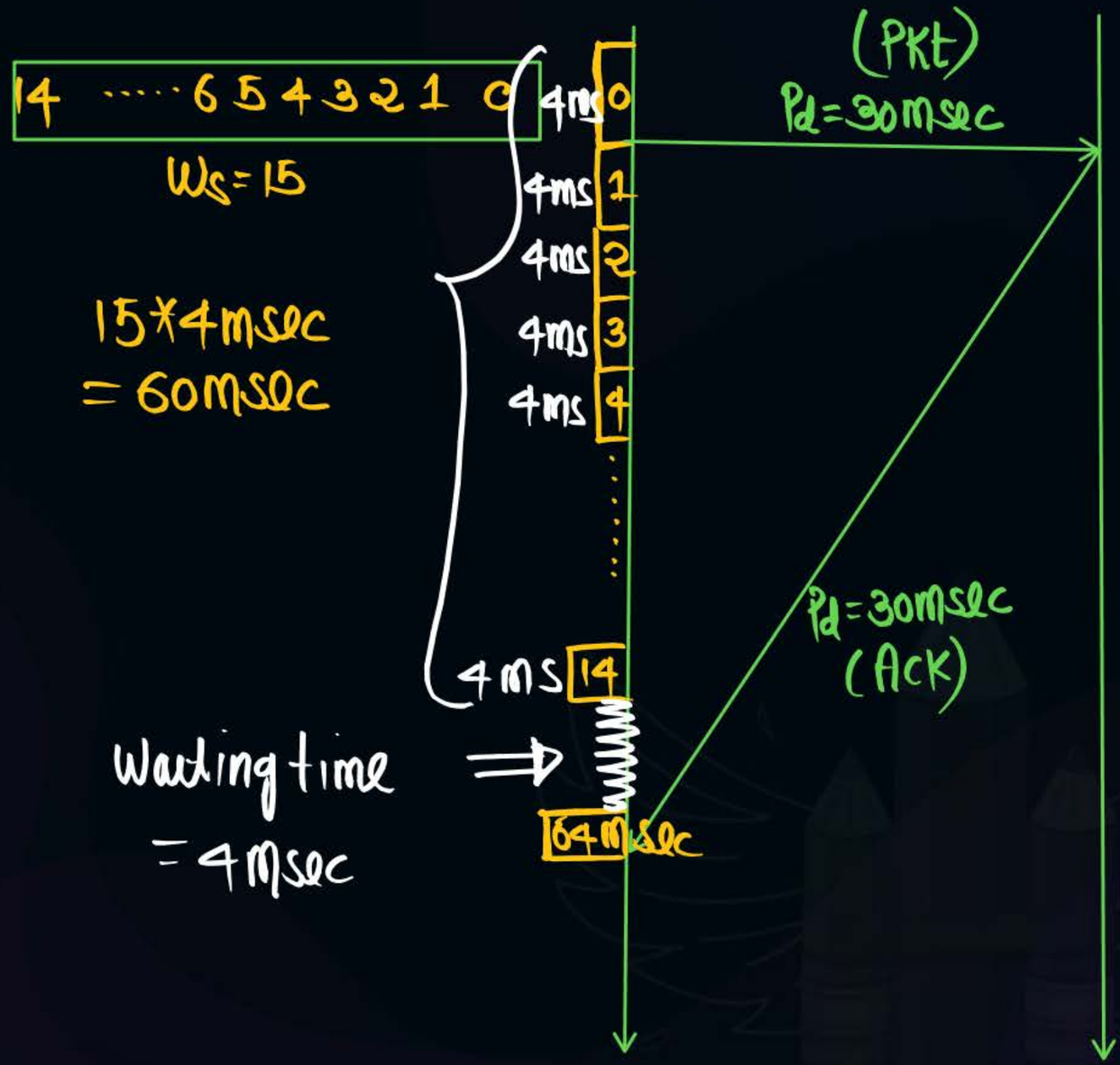
$= 4 * 10^{-3}$ sec = 4 msec

GBN

SeqNo = K bit , K = 4 bit

Ws	Wr
$2^K - 1$	1
$2^4 - 1$	1
15	1

N



maximum Amount of time sender Remain idle = Total time − useFul time

$= Td(F) + 2*Pd - N*Td$

$= 4msec + 2*30 - 15*4\ msec$

$= 64msec - 60\ msec$

$= 4msec$

[NAT]

#Q. In selective repeat ARQ, packet size is 2000 bytes transmission time for one packet is 1ms. If distance between hosts is 10 km and signal speed is 4ms per km. (4ms/km) and frame sequence number is 6 bits long in frame format then the throughput (in Mbps) is_____. (up to two decimal places)

H.W

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

Ans: 6.32 MbPs

[MCQ]

#Q. A 100 km long cable runs at the 10Mbps data rate. The propagation speed in the cable is 2/3 the speed of light in vacuum. How many bits fit in the cable?

A. 50,000 bits

B. 5,000 bits

C. 25, 000 bits

D. 2, 500 bits

$d = 100\,km$

$B = 10 * 10^6\ bits/sec$

$v = \frac{2}{3} * 3 * 10^8\ m/sec = 2 * 10^8\ m/sec = 2 * 10^5\ km/sec$

$Pd = \frac{d}{v} = \frac{100\,km}{2 * 10^5\ km/sec} = 50 * 10^{-5}\ sec$

Capacity of Link $= B * Pd = 10 * 10^6\ bits/sec * 50 * 10^{-5}\ sec$

$= 10 * 10 * 50 = 5000\ bits$

2 mins Summary

Flow control

- Topic One
- Topic Two
- Topic Three
- Topic Four
- Topic Five

THANK - YOU

CS & IT ENGINEERING

Computer Network

1500 Series

Lecture No.- 04

By- Ankit Doyla Sir

Recap of Previous Lecture

Topic One topic

Topic Two topic

Topics to be Covered

Topic The transport layer

Topic

[NAT]

#Q. Suppose a TCP message that contains 1024 bytes of data and 20 bytes of TCP header is passed to IP for delivery across two networks interconnected by a router (i.e., it travels from the source host to a router to the destination host). The first network has an MTU of 1024 bytes; the second has an MTU of 576 bytes. Each network's MTU gives the size of the largest IP datagram that can be carried in a link-layer frame. Find the sum of offset value of all the fragments. Assume all IP headers are 20 bytes.

(P & D)

[NAT]

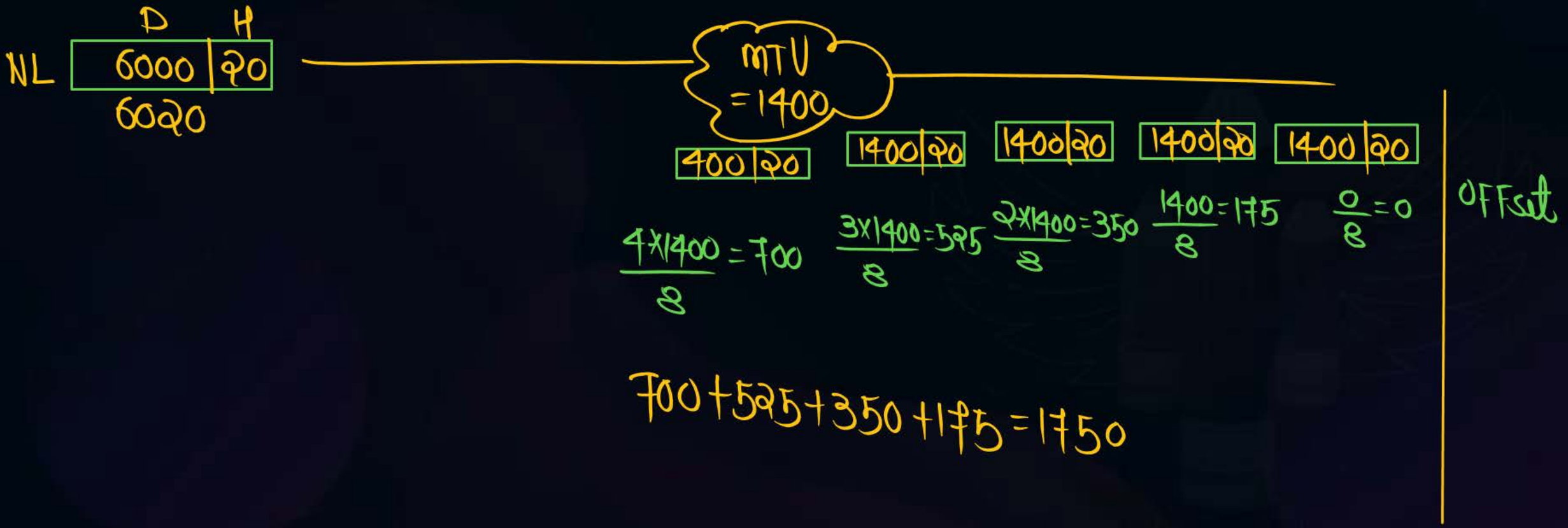
#Q. The transport layer passes a packet size of 4228 to networks layer. The size of header at network layer is 20 bytes and maximum transmission unit (MTU) at underlying layer (DDL) is 1400 bytes excluding header. Find number of fragments and offset value of last fragment at IPv4 packet?

[NAT]

#Q. An IP datagram of size 2000 bytes arrives at a router. The router has to forward this packet on a link whose MTU is 300 bytes. Assume size of IP-Header is 20 bytes. The number of fragments that IP datagram will be divided into transmission is _____?

[NAT]

#Q. Suppose an IP Packet of size 6020 bytes with IP Header size of 20 bytes. Assume maximum transmission unit (MTU) of underlying layer is 1400 bytes without header. What is the sum of offset value of all fragments received_____?



[MCQ]

#Q. A datagram of 4000 bytes (20 bytes of IP Header + 3980 bytes of IP payload) arrives at a router and must be forwarded the link with MTU of 1500 bytes including header size of 20 bytes then at what byte the 2nd fragment is ended?

A 2960

B 1480

C 2959

D 1479

Common Data question

Consider the go back N protocol with a sender's window size of 'n'. Suppose that at time 't', the next in order packet the receiver is expecting has a sequence number of 'p'. Assume that the medium does not reorder messages.

GB-N, $W_S = N$

[MCQ]

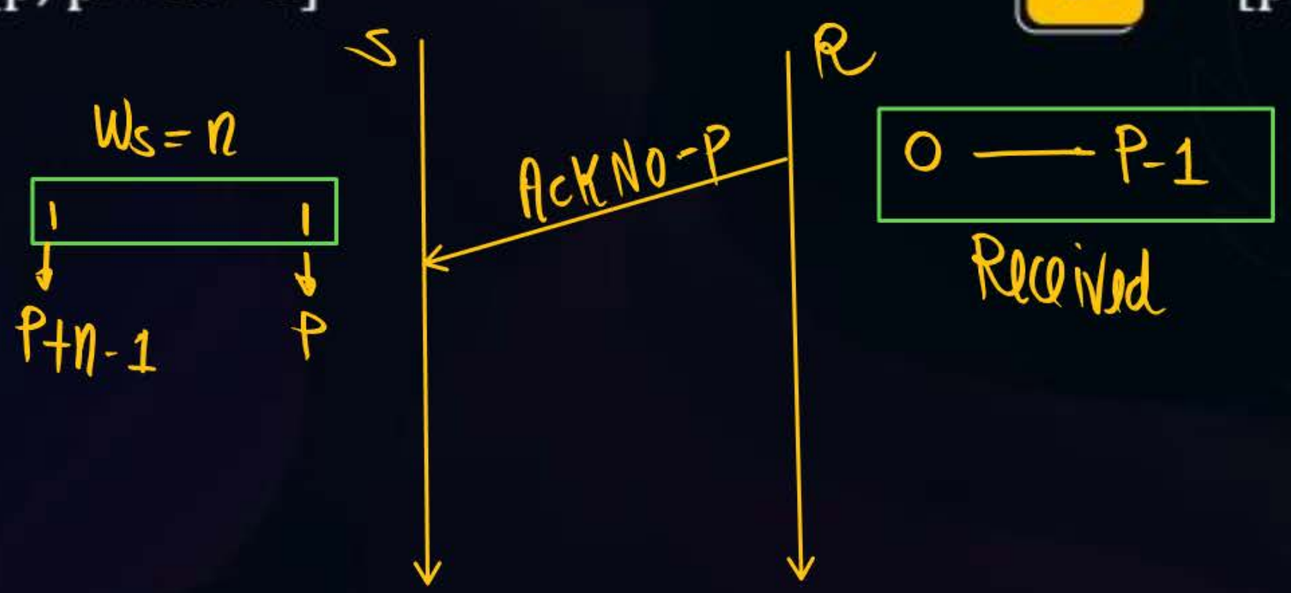
#Q. What are the possible sets of sequence numbers inside the sender's window at time 't'. Assume the sender has already received the ACKs.

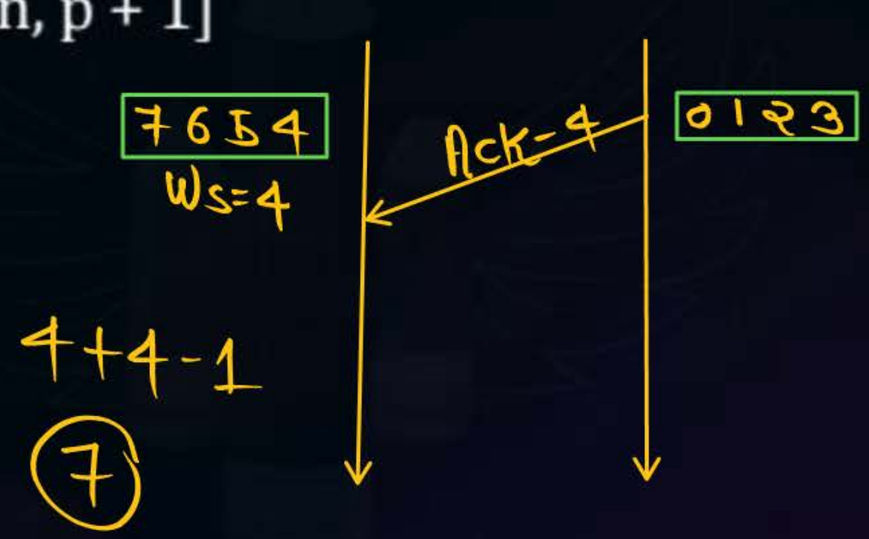
A [p – 1, p + n – 1]

B [p, p + n – 1]

C [p, p + n + n]

D [p + n, p + 1]





[MCQ]

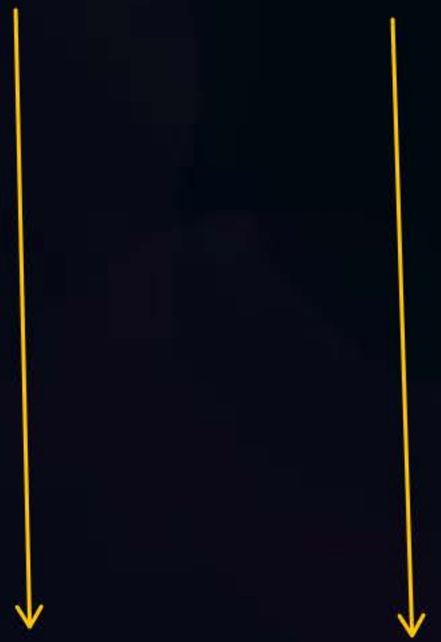
#Q. If acknowledgements are still on their way to sender, what are all possible values of the ACK field in the message currently propagating back to the sender at a time 't'?

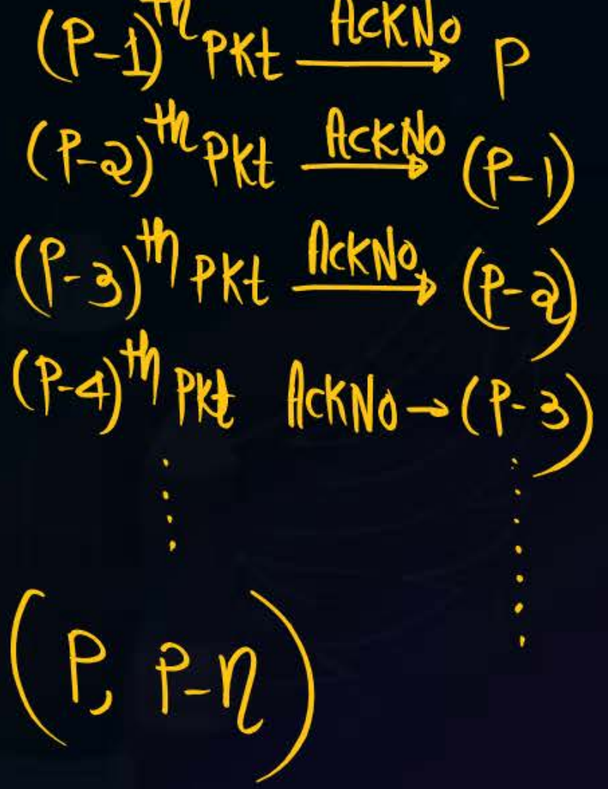
A [p – n, p – 1]

B [p – 1, p – n]

C [p, p – n]

D [p – 1, p + n]





[NAT]

#Q. In an IPv4 diagram, the value of total-length field is $(00A0)_{16}$ and the value of the header-length (HLEN) is $(5)_6$. How many bytes of payload are being carried by the datagram? What is the efficiency (ratio of the payload length to the total length) of this datagram?

[MCQ]

#Q. Can each of the following be the value of the offset field in a datagram?

A 8

B 31

C 73

D 56

[NAT]

An IP packet originally has a size of 7000 bytes including 20-byte header and 6980-bytes payload. To reach the destination, the route goes through three networks, A, B, and C. Network A is the one where the sender is directly connected, and Network C is where the receiver is directly connected. Network A has an MTU of 5000 bytes. Network B has an MTU of 3000 bytes. Network C has an MTU of 1000 bytes. How many fragments of original IP packet are received by the receiver? _____

[MCQ]

In IPv4 packet format, the value of HLEN is 10 and offset value is 200. The total length of packet is 300 bytes. Find first and last byte number of payload/ data packet?

A 200, 460

B 200, 459

C 1600, 1860

D 1600, 1859

[NAT]

An IPv4 packet has the first few Hexa decimal digit as shown below

4500005C00030000 59060000 F22F1582

1st row 2nd row 3rd row 4th row (S.IP)

VER HL Services TL

What is first octet of Source IP Address (in decimal) (242) ?

$(F2)_{16}$

$16^1\ 16^0$

$15*16^1+2*16^0$

$240+2=242$

$(2F)_{16}$

$16^1\ 16^0$

$2*16+15*16^0$

47

$(15)_{16}$

$1*16+5$

21

$(82)_{16}$

$8*16+2=130$

S.I.P = 242.47.21.130

[MSQ]

The transport layer passes a packet size of 4228 to network layer. The size of header at network layer is 20 bytes and maximum transmission unit (MTU) at underlying layer (DDL) is 1420 bytes. Which of the following options is/are TRUE?

A. Number of fragments are 3

B. Offset value of last fragment at IPv4 packet is 350

C. Data Size of last fragmented is 28 bytes.

D. Sum of offset value of all fragments is 1050.

[NAT]

$$56 \times 41 = 2296$$

An IPv4 datagram is received by an IPv4 Router, Header length (HLEN) field contains value 10 and total length field contains value 2340, MTU of the link is 100 bytes. Then total number of IP fragments after fragmentation (41)

$$56 \times 40 = 2240 \qquad 2300 - 2240 = 60$$

HLEN = 10

Header size = 10 × 4 = 40B

Total length = 2340

Data + Header = 2340

data = 2340 − 40 = 2300

$$\text{No. of Fragments} = \frac{2300}{56} = 41.07 \simeq 42 \text{ Fragment}$$

[MCQ]

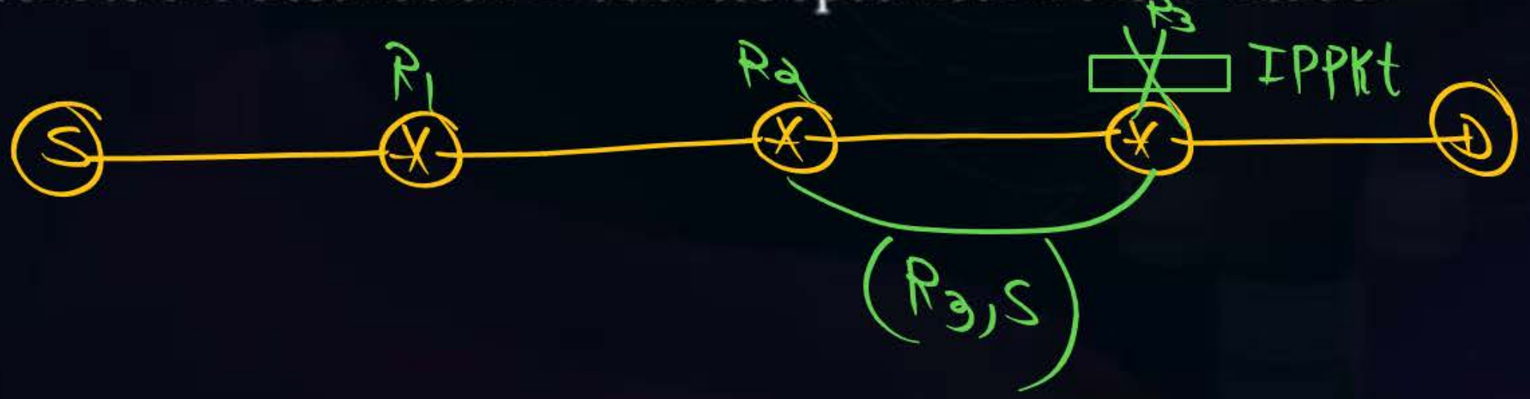
When routers generate ICMP messages, to where do they send them?

A The messages are sent to the source port address specified in the TCP header

B The messages are sent to the destination port address specified in the TCP header

C The messages are sent to the source IP address specified in the IP header

D The messages are sent to the destination IP address specified in the IP header



[NAT]

Host A sends an IP datagram to host B. Both A and B hosts uses TCP/IPV4 Network. Assume that no error occurred during the transmission of the datagram. When datagram reaches B some of the IP header field may be different from that of original datagram. Consider the following fields

(1) VER (Not changed)
(2) Total length (may be changed)
(3) TTL (D. changed)
(4) Fragment offset (may be changed)
(5) Services (Not changed)
(6) HELN (may be changed)
(7) Checksum (changed)
(8) MF (may be changed)

Assume that among the number of IP header field which will have different values as compare to their original datagram when reached to the destination is x. Then what will be the value of x? (6)

Very Handsome STudent Is Fully Fine To Play Hockey

1st row
- V → VER
- H → HLEN
- S → services
- T → Total length

2nd row
- I → Identification No.
- F → Flags
- F → Fragment offset

3rd row
- T → TTL
- P → Protocol
- H → Header checksum

and then SIP, DIP
4th row 5th row

2 mins Summary

The transport layer

- Topic One
- Topic Two
- Topic Three
- Topic Four
- Topic Five

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CS & IT ENGINEERING

Computer Network

1500 Series

Lecture No.- 05

By- Ankit Doyla Sir

Recap of Previous Lecture

Topic One topic

Topic Two topic

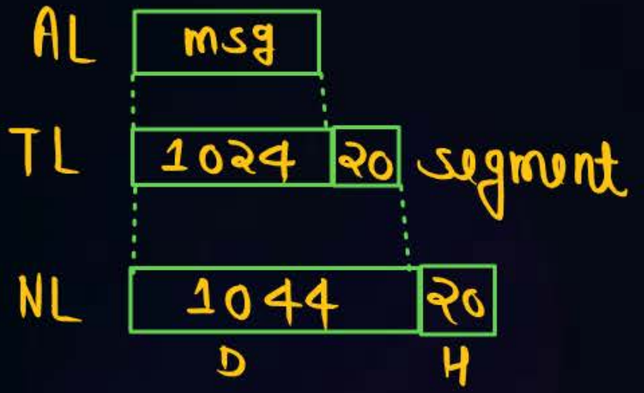
Topics to be Covered

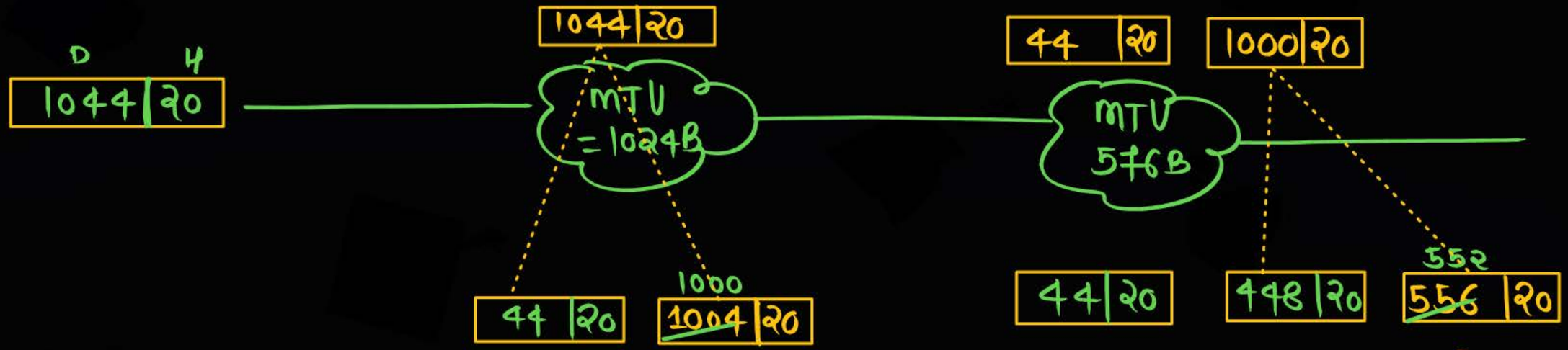
Topic TCP

Topic

[NAT]

#Q. Suppose a TCP message that contains 1024 bytes of data and 20 bytes of TCP header is passed to IP for delivery across two networks interconnected by a router (i.e., it travels from the source host to a router to the destination host). The first network has an MTU of 1024 bytes; the second has an MTU of 576 bytes. Each network's MTU gives the size of the largest IP datagram that can be carried in a link-layer frame. Find the sum of offset value of all the fragments. Assume all IP headers are 20 bytes. (194)





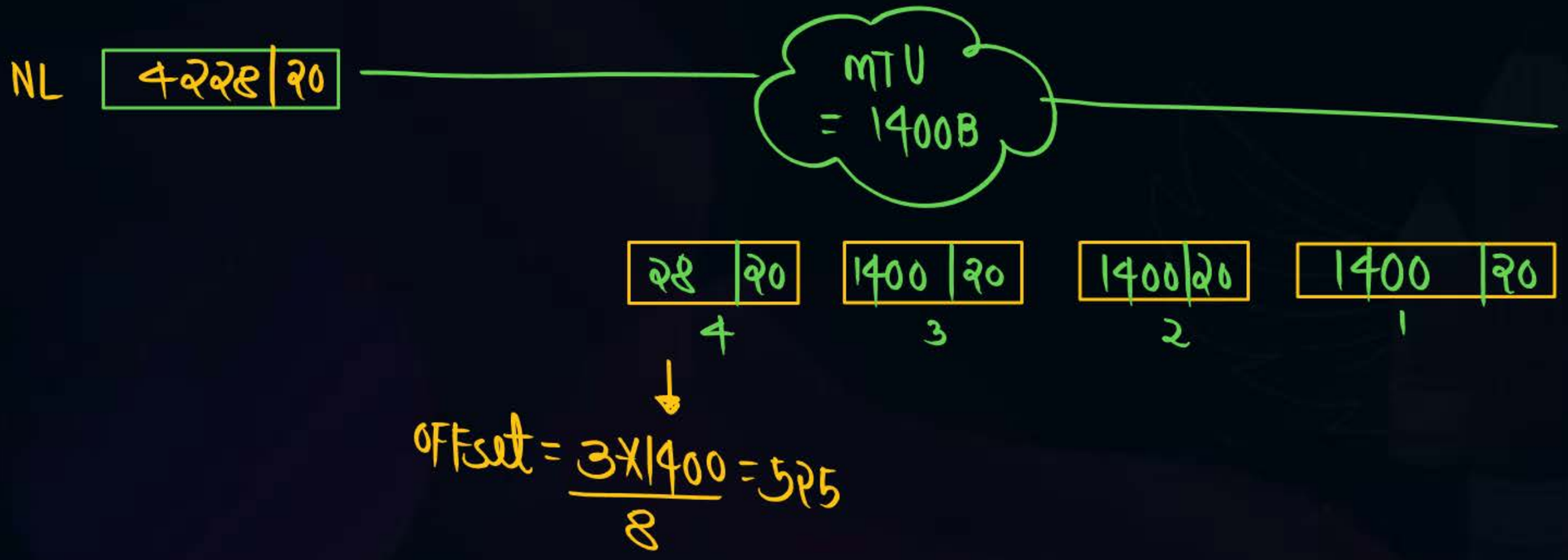
$\frac{552+448}{8} = 125$ $\frac{552}{8} = 69$ $\frac{0}{8} = 0$

Fragment offset

Sum of offset = 125 + 69 + 0 = 194

[NAT]

#Q. The transport layer passes a packet size of 4228 to networks layer. The size of header at network layer is 20 bytes and maximum transmission unit (MTU) at underlying layer (DDL) is 1400 bytes excluding header. Find number of fragments and offset value of last fragment at IPv4 packet?



[NAT]

#Q. An IP datagram of size 2000 bytes arrives at a router. The router has to forward this packet on a link whose MTU is 300 bytes. Assume size of IP-Header is 20 bytes. The number of fragments that IP datagram will be divided into transmission is _____?

(Ans: 8)

[MCQ]

#Q. A datagram of 4000 bytes (20 bytes of IP Header + 3980 bytes of IP payload) arrives at a router and must be forwarded the link with MTU of 1500 bytes including header size of 20 bytes then at what byte the 2nd fragment is ended?

A 2960

B 1480

C 2959

D 1479


D
H
NL
3980
20
MTU
1500
2959
1480
1479
0
1480
20
1480
20

[NAT]

#Q. In an IPv4 diagram, the value of total-length field is $(00A0)_{16}$ and the value of the header-length (HLEN) is $(5)_{16}$. How many bytes of payload are being carried by the datagram? What is the efficiency (ratio of the payload length to the total length) of this datagram?

$TL = (00A0)_{16}$

$16^1 16^0$

$10 * 16^1 = 160$

$HLEN = (5)_{16}$

16^0

$5 * 16^0 = 5$

Header size $= 5 * 4 = 20$ Byte

$TL = D + H$

$D = TL - H$

$D = 160 - 20 = 140$

$\text{efficiency} = \frac{140}{160}$

$= 0.875$

$= 87.5\%$

[MSQ]

#Q. Can each of the following be the value of the offset field in a datagram? (H.W)

A 8

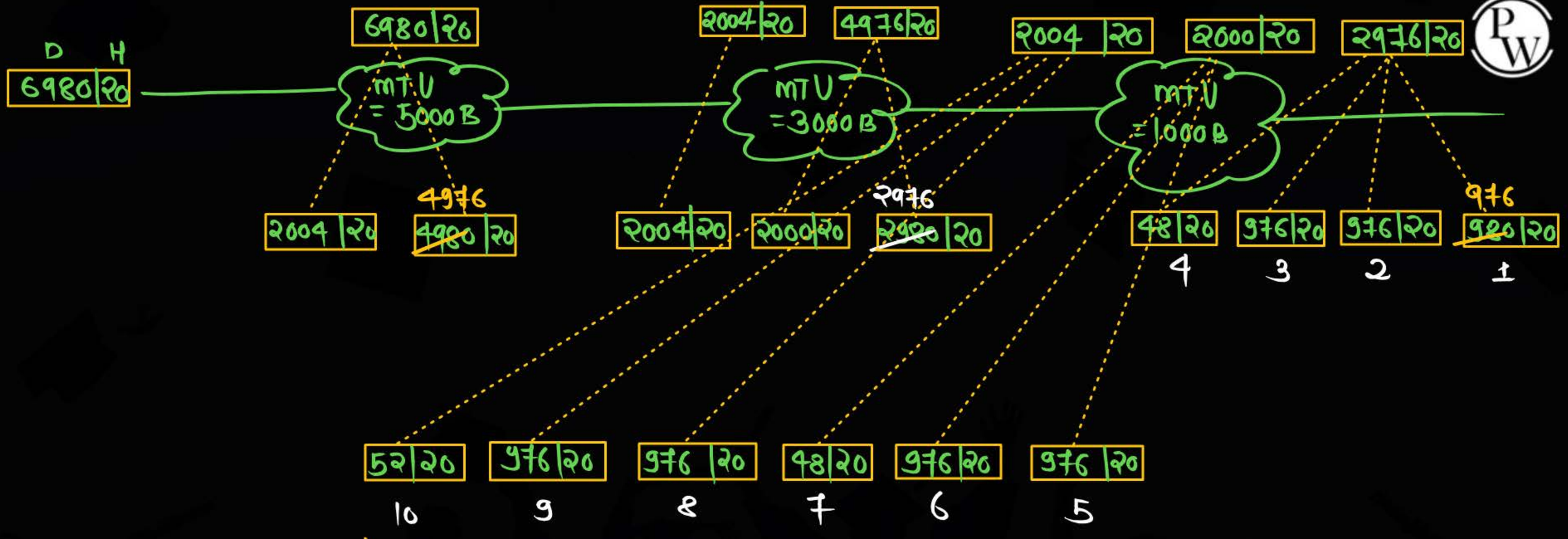
B 31

C 73

D 56

[NAT]

An IP packet originally has a size of 7000 bytes including 20-byte header and 6980-bytes payload. To reach the destination, the route goes through three networks, A, B, and C. Network A is the one where the sender is directly connected, and Network C is where the receiver is directly connected. Network A has an MTU of 5000 bytes. Network B has an MTU of 3000 bytes. Network C has an MTU of 1000 bytes. How many fragments of original IP packet are received by the receiver? also Find the offset Value of Last Fragment ? (5 min)



$$\text{Offset} = \frac{2976+2000+976+976}{8} = \frac{6928}{8} = 866$$

$$[6980-52=6928]$$

[MCQ]

In IPv4 packet format, the value of HLEN is 10 and offset value is 200. The total length of packet is 300 bytes. Find first and last byte number of payload/ data packet?

(H·W)

A 200, 460

B 200, 459

C 1600, 1860

D 1600, 1859

[MSQ]

The transport layer passes a packet size of 4228 to network layer. The size of header at network layer is 20 bytes and maximum transmission unit (MTU) at underlying layer (DDL) is 1420 bytes. Which of the following options is/are TRUE?

A. Number of fragments are 3

B. Offset value of last fragment at IPv4 packet is 350

C. Data Size of last fragmented is 28 bytes.

D. Sum of offset value of all fragments is 1050.

$\frac{3\times1400}{8}=525$ $\frac{2\times1400}{8}=350$ $\frac{1400}{8}=175$ $\frac{0}{8}=0$

SUM = 525+350+175+0 = 1050

[MCQ]

#Q. Suppose that 5000 bytes are transferred over TCP. The first byte is numbered 20050. What are the sequence numbers for each segment if data is sent in four segments with the first two segments carrying 1000 bytes and the last two segments carrying 1500 bytes?

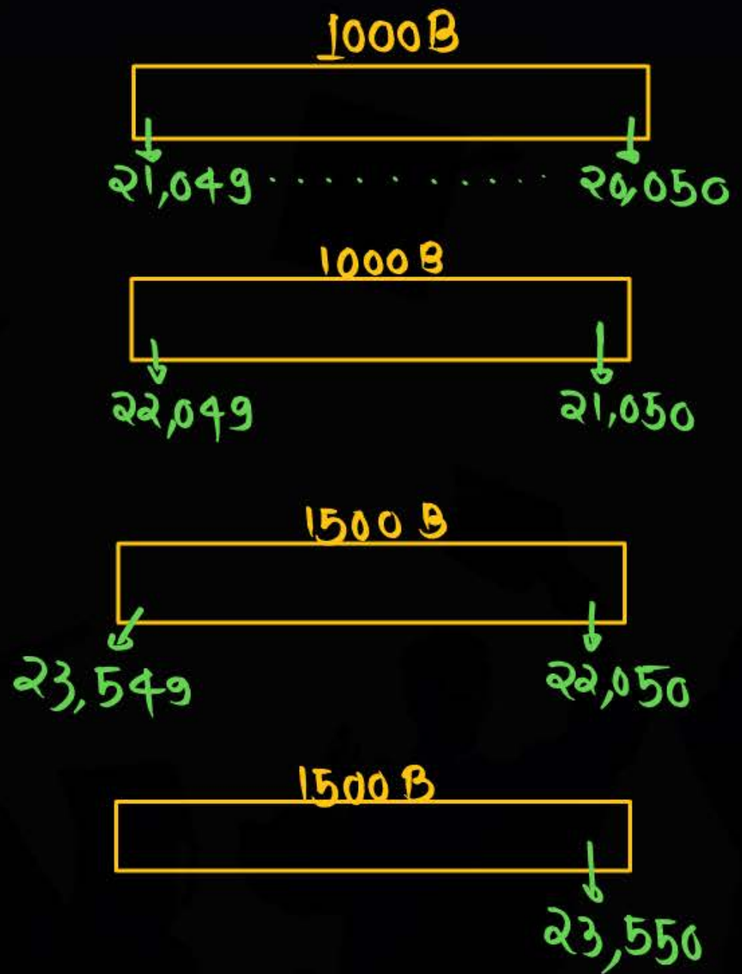
A. Sequence No. of first segment=20051, 2nd segment=21051, 3rd segment=22051, 4th segment=23551

B. Sequence No. of first segment=20050, 2nd segment=21050, 3rd segment=22050, 4th segment=23550

C. Sequence No. of first segment=20049, 2nd segment=21049, 3rd segment=22049, 4th segment=23549

D. None

5000 Byte


1000 B
21,049
21,050
1000 B
22,049
21,050
1500 B
23,549
22,050
1500 B
23,550

[MSQ]

#Q. Which of the following is/are true about IEEE 802.3 frame format?

PL

(P) (SFD) (DA) (SA) (LD) (4B)

mindata = 46B , 46B + 7B + 1B + 6B + 6B + 2B + CRC

DLL (18)

46 + 18 = 64B

A. The minimum frame size in IEEE 802.3 is 64 bytes

B. The maximum frame size in IEEE 802.3 is 1500 bytes

C. The maximum frame size in IEEE 802.3 is 1518 bytes. (1500 + 18)

Data H

D. The maximum data size in IEEE 802.3 is 1500 bytes.

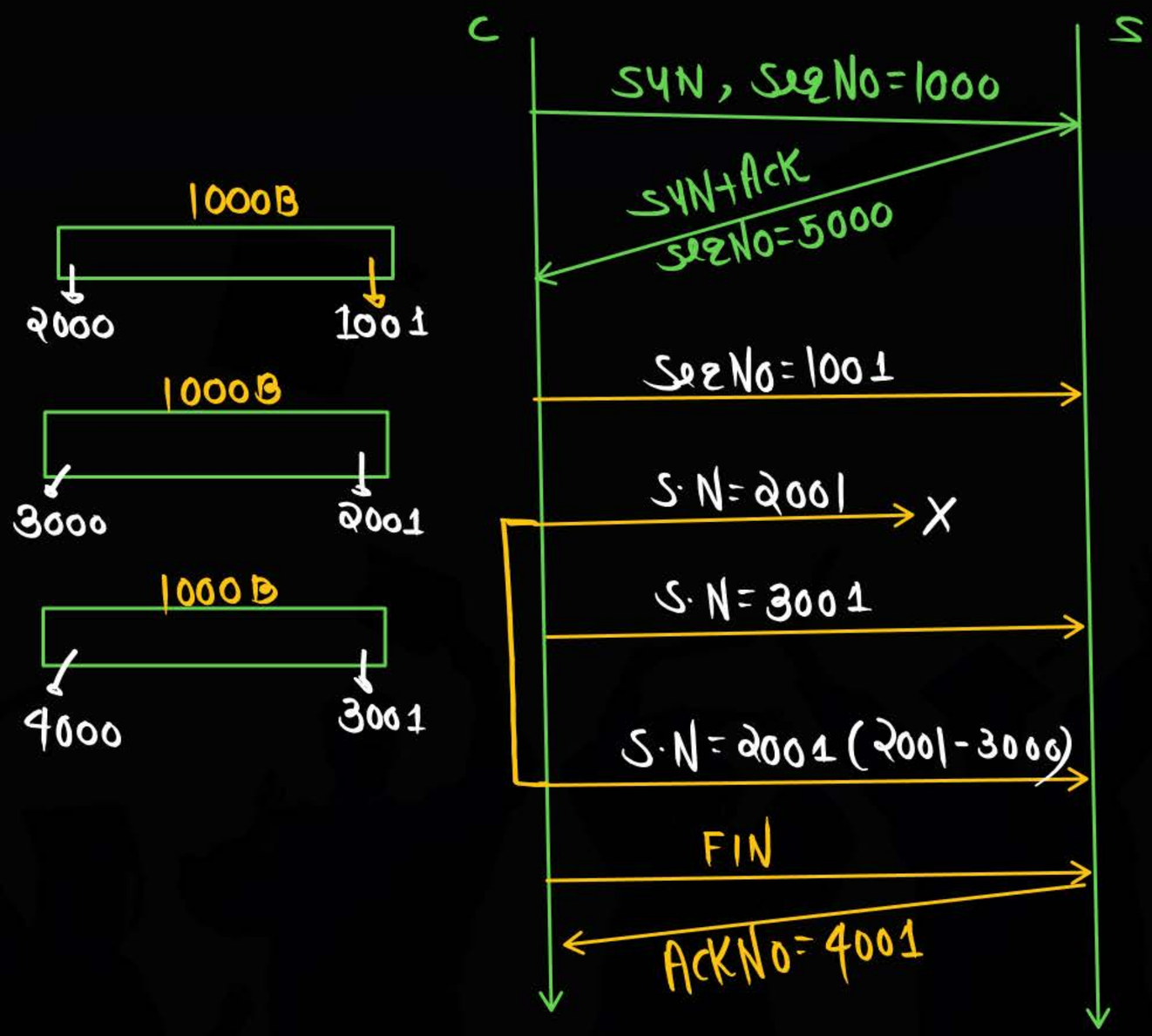
(A, C, D)

[NAT]

You establish a single TCP connection to a web server with a SYN segment having an initial sequence number of 1000. The web server responds hack with a SYN-ACK segment having an initial sequence number of 5000. During the time this connection is open, you have to transmit a total of 3 segments of data each segment has a 1000 bytes payload. The web server also has to transmit a total of 20 segments worth of data each segment has a 1000 bytes payload. One of your 3 segments has to be retransmitted because it is lost, effectively causing you to make 4 segment transmissions. When the connection terminates, what is the sequence number in the ACK field of the segment you receive from the server in response to your transmission of the FIN segment? _____ (Assume that the last segment of data contains FIN also)

(3 min)

(4001)

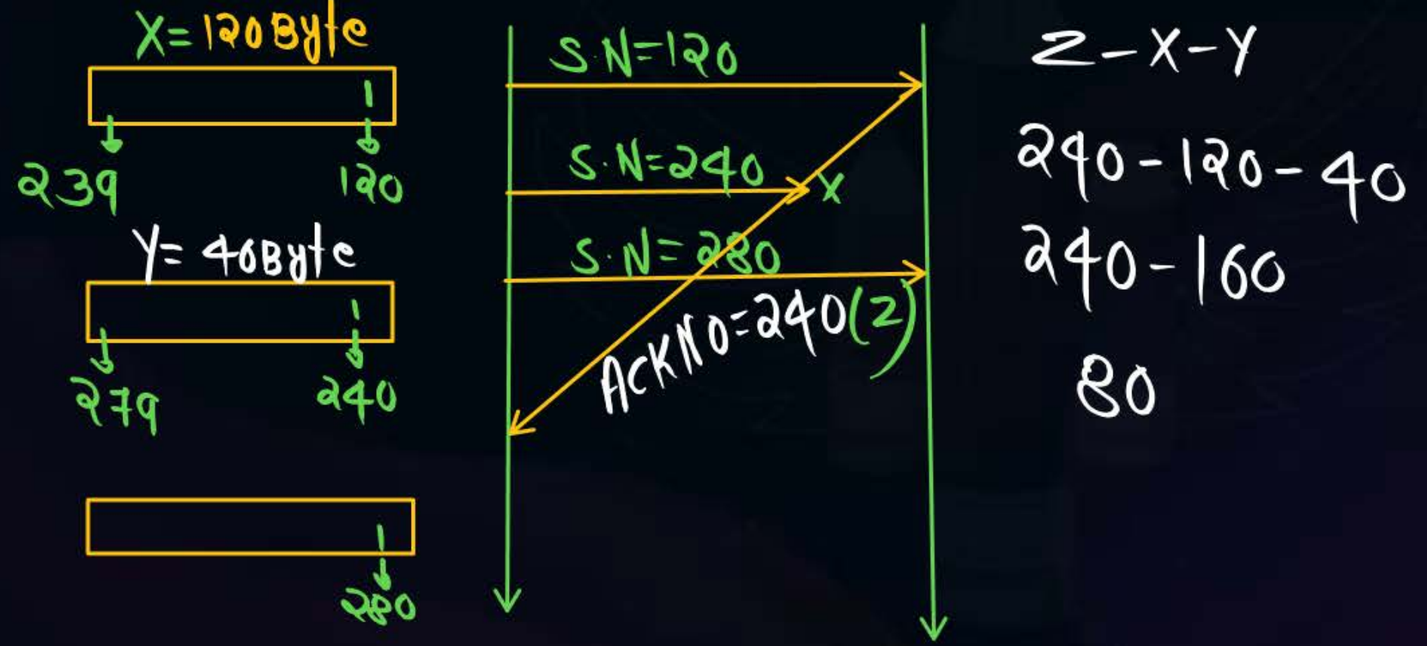

C
S
SYN, SeqNo=1000
SYN+Ack
SeqNo=5000
1000B
2000
1001
SeqNo=1001
1000B
3000
2001
S.N=2001
X
S.N=3001
1000B
4000
3001
S.N=2001 (2001-3000)
FIN
AckNo=4001

[NAT]

#Q. Consider an instance of TCP connection where all the previous transferred packets got ACK. The sender sends three segments with sequence number 120, 240, 280 respectively. The first and third segment received correctly but the second segment get lost.

Let X be the amount of data carried in the first segment (in bytes) and Y be the data carried in the second segment (in bytes) and Z be the ACK value after this instance.

Then Z-X-Y = (80) .



[MSQ]

#Q. Which of the following statement is/are correct?

(A, B, C, D)

A. The minimum size of UDP datagram is 8 byte at the transport layer and 28 byte at IP layer

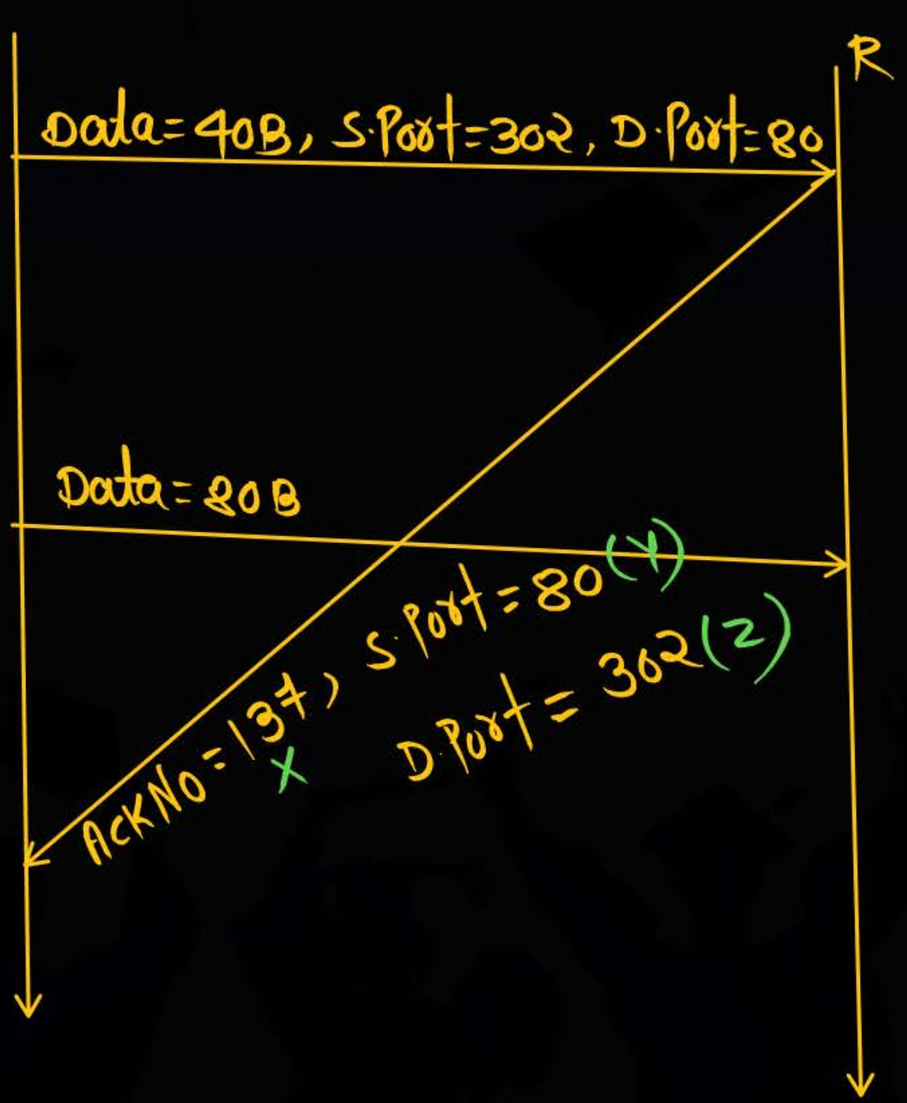
B. Maximum size of UDP datagram is 65,535 byte

C. The minimum size of the process data that can be encapsulated in the UDP datagram is 0 byte

D. The maximum size of the process data that can be encapsulated in the UDP datagram is 65, 507 byte

[NAT]

#Q. Host A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 96. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 40 and 80 bytes of data, respectively. In the first segment, the sequence number is 97, the source port number is 302, and the destination port number is 80. Host B sends an acknowledgment whenever it receives a segment from Host A. If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number(X), the source port number(Y), and the destination port number(Z) then the value of X+Z–Y is (395)



upto 96th Byte Already Received

$X+Z-Y$

$= 137 + 302 - 80$

$= 359$

2 mins Summary

TCP

- Topic One
- Topic Two
- Topic Three
- Topic Four
- Topic Five

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CS & IT ENGINEERING

Computer Network

1500 Series

Lecture No.- 06

By- Ankit Doyla Sir

Recap of Previous Lecture

Topic

Topic

Computer Network Part 05

Topics to be Covered

Topic

Topic

Computer Network Part 06

[MSQ]

#Q. Which of the following is/are correct about IP Address?

(A)

A. Destination IP Address is a part of IP header.

B. TTL value of can be possible in IP header from range 1 to 256.

C. TTL value of can be possible in IP header from range 0 to 255

D. TTL is used in IP header to reduce the packet delay

[NAT]

$B = 40 * 10^9$ bits/sec $= 5 * 10^9$ Byte/sec

#Q. 7 number of extra bits must be used from the option field of TCP header to make the Wrap around time half of the normal life time of TCP segment. Consider the bandwidth of network is 40 Gbps.

LT = 180sec = 3min

WAT = 90sec

$$WAT = \frac{\text{Total sequence}}{(\text{Bandwidth})\ \text{Byte/sec}}$$

Total Sequence No = WAT * (Bandwidth) Byte/sec

$= 90\text{sec} * 5 * 10^9$ Byte/sec

$= 450 * 10^9$

$\approx 2^9 * 2^{30}$

$\approx 2^{39}$

$\lceil \log_2 450 * 10^9 \rceil$

Sequence No = 39 bit

extra bits = 39 − 32 (Seq No)

= 7

[MCQ]

#Q. Let assume, a TCP sends three consecutive segments having sequence number value 200, 250 and 300 consecutively. First and second segment were lost due to network traffic but the third segment reached the destination properly. Which of the given options is correct that specific the two parameters:

(i) Amount of data carried in first two segment

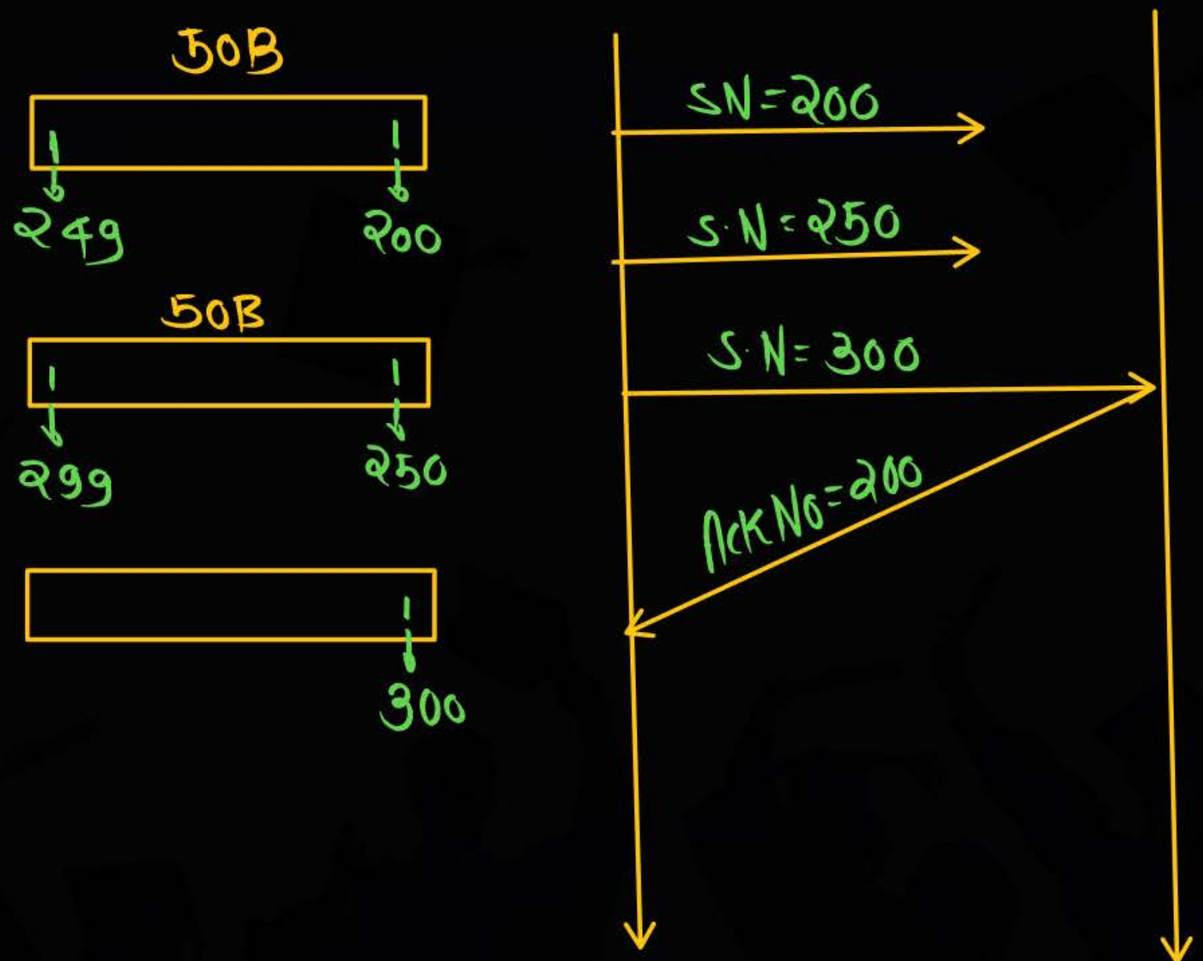
(ii) ACK number sent by the receiver, present while acknowledging the third segment

A 50, 250

B 50, 200

C 200, 200

D 50, 201


50B
249
200
50B
299
250
300
SN=200
S.N=250
S.N=300
AckNo=200

[MCQ]

(K&R)

#Q. Let the size of congestion window of TCP connection be 64kb when a time out occurs. The round trip time of connection is 100 milliseconds and the maximum segment size used is 4kb. The time taken (in milliseconds) by the TCP connection to get back to 64kb congestion window is

A 1100 to 1300

B 800 to 1000

C 1400 to 1600

D 1500 to 1700

NTH = 32KB

$$11RTT = 11 * 100msec = 1100msec$$

(1100 - 1300)

Consider the following statements regarding the congestion avoidance phase of the TCP congestion control algorithm. Note that cwnd stand for the TCP congestion window and MSS denotes the Maximum Segment Size.

i. The cwnd increases by 1 MSS on every successful acknowledgment.

ii. If an ACK arrive the size of the cwnd increases only 1/cwnd portion of MSS

iii. The cwnd increases by 1 MSS every round trip time.

iv. The cwnd approximately doubles every round trip time

Which one of the following is correct?

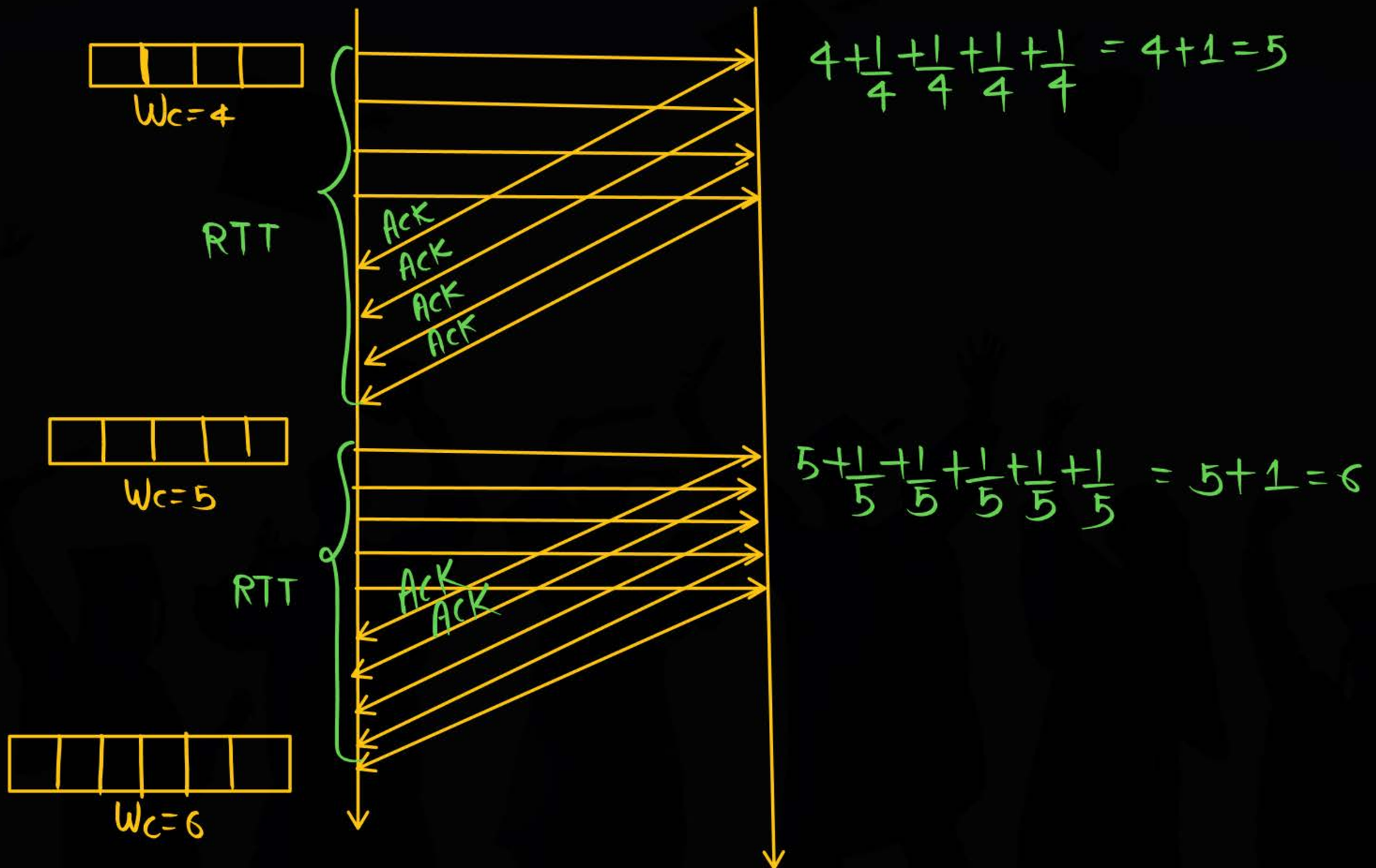
A Only (ii) and (iii) are true

B Only (iv) is true

B Only (i) and (iii) are true

D Only (i) and (iv) are true

Congestion Avoidance Phase



$4+\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\frac{1}{4} = 4+1=5$

$5+\frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{5} = 5+1=6$

[NAT]

If window receiver size is 64 KB and The round trip time of a connection is 50 msec and maximum segment size used is 4 KB. If Sender received 3rd duplicate acknowledgement on 5th transmission then find congestion window size (in KB) on 10th transmission (34KB)

$W_R = 64KB$ segmentsize = 4KB

$TH = \frac{1}{2} W_R$

$TH = 32KB$

[NAT]

If window receiver size is 64 KB and The round trip time of a connection is 50 msec and maximum segment size used is 4 KB.In slow start phase the current congestion window size is 16 MSS and sender gets 4 ACK then then what should be value of congestion window (In KB)_____

TO

2 mins Summary

- **Topic** One
- **Topic** Two
- **Topic** Three
- **Topic** Four
- **Topic** Five

THANK - YOU

CS & IT ENGINEERING

Computer Network

1500 Series

Lecture No.- 07

By- Ankit Doyla Sir

Recap of Previous Lecture

Topic

Topic

Questions Practice

Topics to be Covered

Topic TCP

Topic UDP

ICMP

[NAT]

#Q. An IPv4 datagram has arrived in which the offset value is 900. The HLEN is 10, and the value of total length field is 500 and m bit is 0. If the number of first byte is x and the last is y then what will be the value of x + y?

OFFset = 900

No. of data Byte ahead of this Fragment = 8*900 = 7200

HLEN = 10

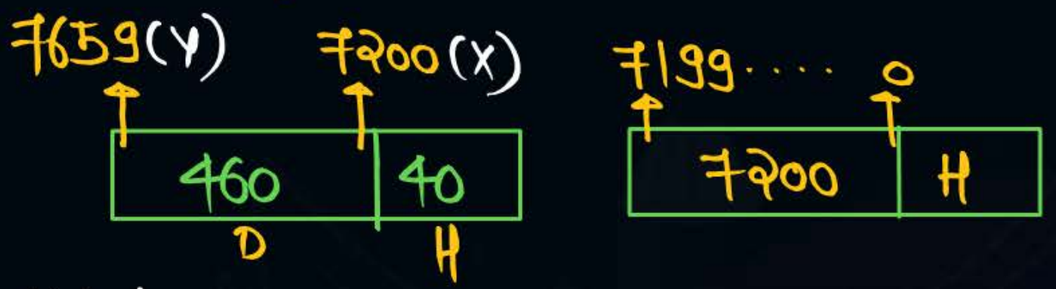
Header size = 10*4 = 40 Byte

TL = 500

D + H = 500

D = 500 - 40 = 460

M = 0 (Last Fragment)



X + Y = 7200 + 7659

= 14859

[MCQ]

#Q. Consider the following protocols:

P_1 : TCP

P_2 : UDP

P_3 : ICMP

P_4 : IGMP

The order in which router eliminate the datagram from it's buffer is?

H·W

A $P_1 > P_2 > P_3 > P_4$

B $P_2 > P_1 > P_3 > P_4$

C $P_3 > P_4 > P_1 > P_2$

D $P_3 > P_4 > P_2 > P_1$

[MCQ]

#Q. A TCP connection is using a window size of 10,000 bytes, and the previous acknowledgement number was 22,001. It receives a segment with acknowledgement number 24,001 and window size advertisement of 10,000. What is the range of sequence number in the window after receiving acknowledgement segment?

H·W

A 22001 – 24000

B 22001 – 32000

C 24001 – 34000

D 24001 – 36000

[MCQ]

#Q. Consider sending a large file from a host to another over a TCP connection that has no loss. Suppose TCP uses AIMD for its congestion control without slow start. Assuming cwnd increases by 1 MSS every time a batch of ACKs is received and assuming approximately constant round-trip times, how many RTTs would it take for cwnd increase from 6 MSS to 12 MSS (assuming no loss events)?

H.W

A 6 RTTs

B 7 RTTs

C 3 RTTs

D 12 RTTs

[NAT]

#Q. Consider a single TCP connection on a 10 Mbps link with MSS = 1500 bytes and RTT = 150 ms. What is the maximum window size (in segments) achieved? _____

RTT = 150 msec

$B = 10 * 10^6$ bits/sec

1 sec ——— $10 * 10^6$ bits

$150 * 10^{-3}$ sec ——— $150 * 10^{-3} * 10 * 10^6$ bits

$= 150 * 10 * 10^3$ bits

$= 1500 * 10^3$ bits

Window size $= \frac{1500 * 10^3}{8}$ Byte

$= 187,500$ Byte

Window size = 187,500 Byte

Window size (in segments)

$= \frac{187,500 \text{ Byte}}{1500 \text{ Byte}}$

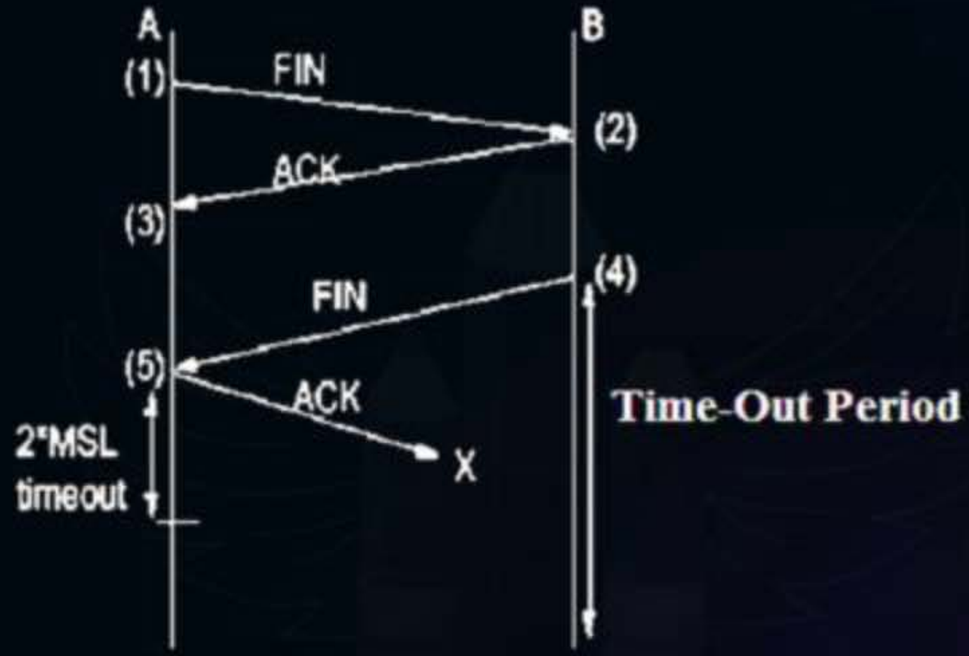
$= 125$

[MCQ]

Data for the next two question, timeline showing exchange of some segments between TCP A and TCP B during connection termination. X indicates that ACK segment was lost.

H·W

#Q. What are the states of TCP A at (1), (3) and (5) respectively?



A FIN_WAIT1, TIME_WAIT, FIN_WAIT2.

B FIN_WAIT1,CLOSE_WAIT, TIME_WAIT.

C FIN_WAIT1, FIN_WAIT2, TIME_WAIT.

D FIN_WAIT1, FIN_WAIT2, CLOSE_WAIT.

[MCQ]

#Q. What are the states of TCP B at (2) and (4) respectively?

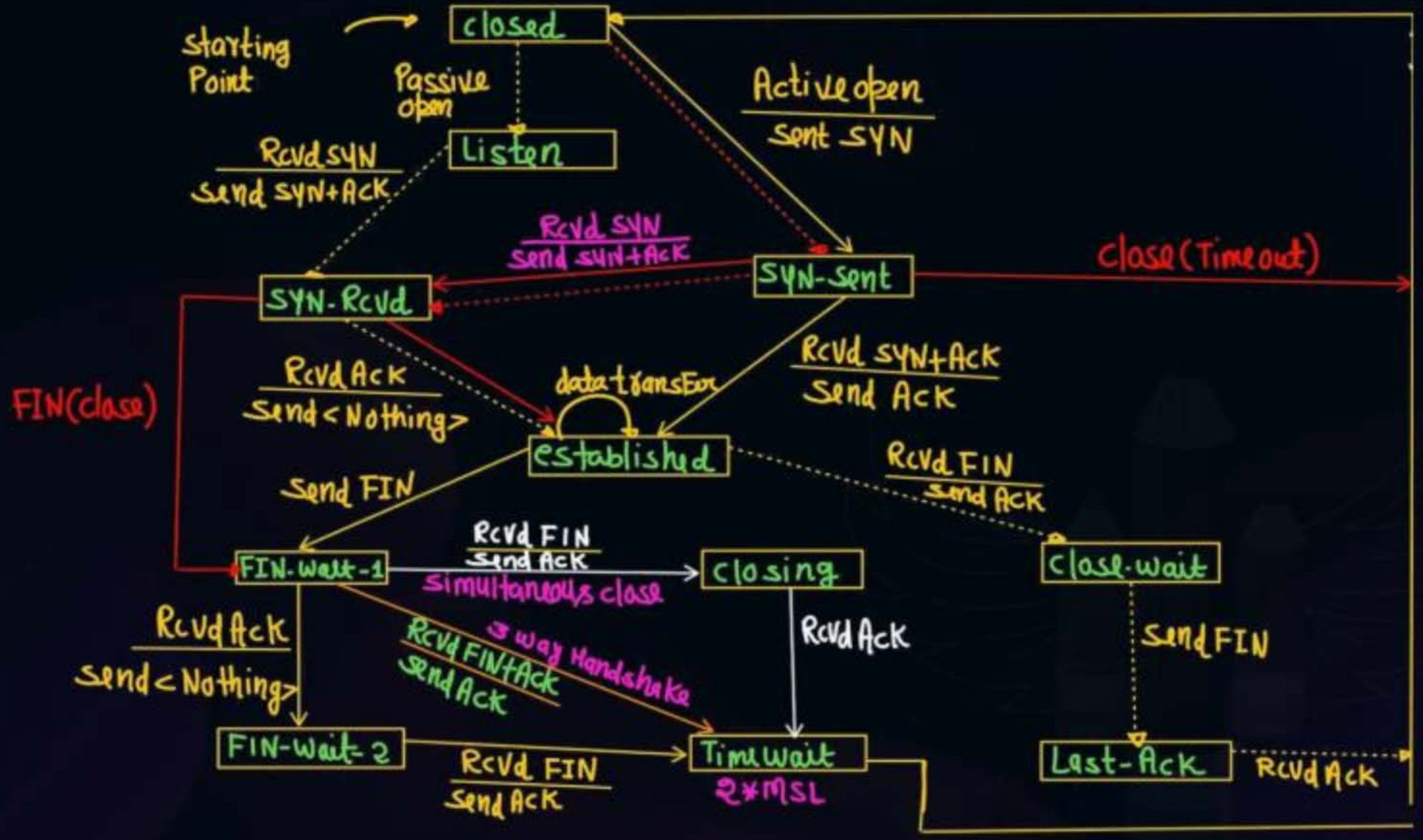
H·W

A FIN_WAIT1, FIN_WAIT2

B CLOSE_WAIT, FIN_WAIT2

C CLOSE_WAIT, TIME_WAIT

D CLOSE_WAIT, LAST_ACK


closed
Starting Point
Passive open
Active open
Sent SYN
Listen
Rcvd SYN
Send SYN+Ack
Rcvd SYN
Send SYN+Ack
SYN-Rcvd
SYN-Sent
close (Timeout)
FIN(close)
Rcvd Ack
Send <Nothing>
data transfer
Rcvd SYN+Ack
Send Ack
established
Send FIN
Rcvd FIN
Send Ack
Rcvd FIN
Send Ack
FIN-Wait-1
closing
close-wait
simultaneous close
Rcvd Ack
Send <Nothing>
3 way Handshake
Rcvd FIN+Ack
Send Ack
Rcvd Ack
Send FIN
FIN-Wait-2
Rcvd FIN
Send Ack
Time wait
2*MSL
Last-Ack
Rcvd Ack

[MSQ]

#Q. The first Few Hexadecimal digits of TCP Header are given
5EFA 00 FD 001C 3297
Which of the following statement is/are correct ?

H·W

A Source port =24314 & Destination port =253

B Source port =20480 & Destination port =253

C Packet is going from client to server

D Packet is going server to client

[NAT]

#Q. Consider a network of two workstations A and B and connected to a bus, operated in a slotted manner using the simple ALOHA protocol. A and B each have many frames to transmit. Suppose A and B implement the following strategy: each will attempt to transmit within any particular slot with respective probability pa (0.4) and pb(0.5), independently of each other. If both transmit on the same slot, the slot is wasted due to collision and the frames have to be re-transmitted. What is the efficiency of the scheme? Ans: (.5)

$P_A = 0.4$

$P_B = 0.5$

$$\text{efficiency} = P_A(1-P_B) + P_B(1-P_A)$$

$$= 0.4 * 0.5 + 0.5 * 0.6$$

$$= .2 + .3 = .5$$

[NAT]

HW

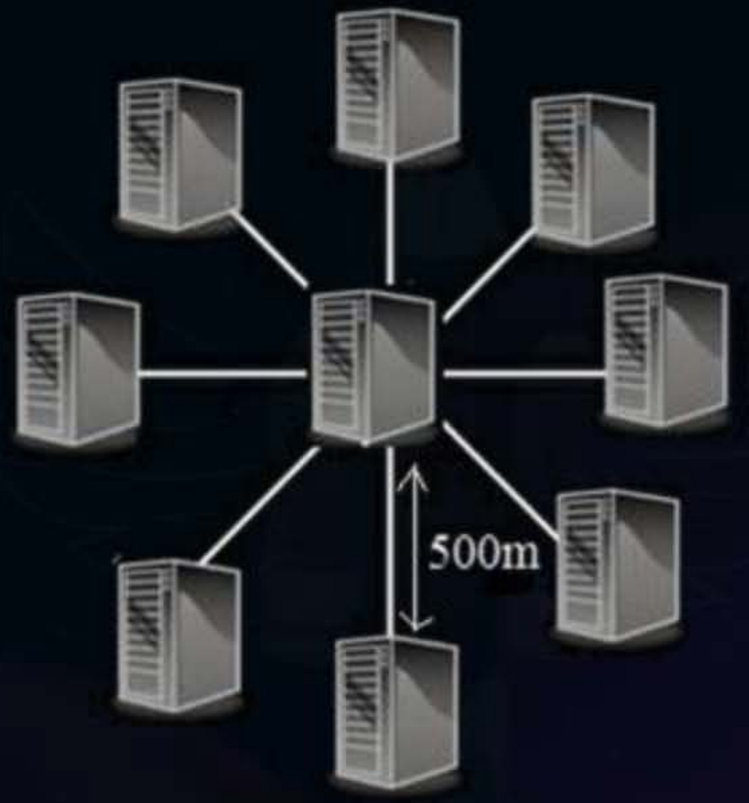
#Q. suppose two nodes, A and B, are attached to opposite ends of a 900-meter cable which includes four repeaters inserted between A and B each inserting a 20-bit transmission delay. A and B each have one frame of 1,000 bits (including all headers and preambles) to send to each other. Both nodes attempt to transmit at time t = 0. Assume the transmission rate is 10Mbps, and CSMA/CD with back off intervals of multiples of 512 bits transmission time is used. After the first collision, A draws 0 and B draws 1 in the exponential backoff protocol. Ignore the jam signal. Assume that a station must wait for extra propagation time to seize the signal of aborted transmission after it detect the collision. If the signal propagation speed is 2 ? 108 m/sec, then what is the one-way propagation delay (including repeater delays) between A and B (in microseconds)? _____

[NAT]

H.W

#Q. Consider the 1 Gbps CSMA/CD broadcasts star in which no two hosts are now more than 500m apart, The CSMA/CD specification requires that if a collision occurs, it must detect the collision before it finishes transmitting a packet.

What is the size of the minimum packet in above network (in bytes)? (Assume the speed of propagation is 2×10^8 m/s.)_____



[MCQ]

Data for the next two questions, assuming there are N active nodes the efficiency of slotted Aloha is $Np(1-p)^{N-1}$

#Q. What is the value of p that maximizes this expression?

$$\cancel{N}\cdot\frac{1}{\cancel{N}}\left(1-\frac{1}{N}\right)^{N-1}$$

$$\left(1-\frac{1}{N}\right)^{N-1}$$

A N

B 1/N

C e

D $1/e$

[MCQ]

#Q. Using the value of p found in question above find the efficiency of slotted Aloha by letting N approach infinity. Hint: (1-1/N)^N approaches 1/e as N approaches infinity.

A N

B 1/N

C e

D 1/e

$$\lim_{N\to\infty} \left(1-\frac{1}{N}\right)^{N-1}$$

$$= \frac{1}{e}$$

[MCQ]

#Q. Two host A and B are connected over a sequence of N links, each of transmission rate R and propagation delay D. All packet switches are store-and-forward. Host A sends a file of size F to host B, as a sequence of back-to-back packets of size L. The transfer time for the file is F/R + 9L/R + 10msec. Assume no queuing and processing delays. Which of the following is true?

A. N=1 link, D=10msec.

B. N=9 links, D=1msec.

C. N=10 links, D=1msec.

D. N=10 links, D=10msec.

No. of Links | Hops (X) = N , B = R , Propagation delay (Pd) = D

File size = F

Packet size = L

$T_d = \frac{\text{Pkt size}}{\text{Bandwidth}} = \frac{L}{R}$

$\text{Total time} = \frac{F}{R} + 9\frac{L}{R} + 10$

$\text{No. of Pkts}(N) = \frac{F}{L}$

X → Hops, and 'N' PKts

Total time = $X[T_d + P_d] + X-1[\cancel{Q_d + P_{rd}}] + N-1(T_d)$

$\frac{F}{R} + 9\frac{L}{R} + 10 = N\left[\frac{L}{R} + D\right] + \left(\frac{F}{L} - 1\right)\frac{L}{R}$

$N = 10,\ D = 1$

$10\left[\frac{L}{R} + 1\right] + \left(\frac{F}{L} - 1\right)\frac{L}{R}$

$10\frac{L}{R} + 10 + \frac{F}{\cancel{L}} * \frac{\cancel{L}}{R} - \frac{L}{R}$

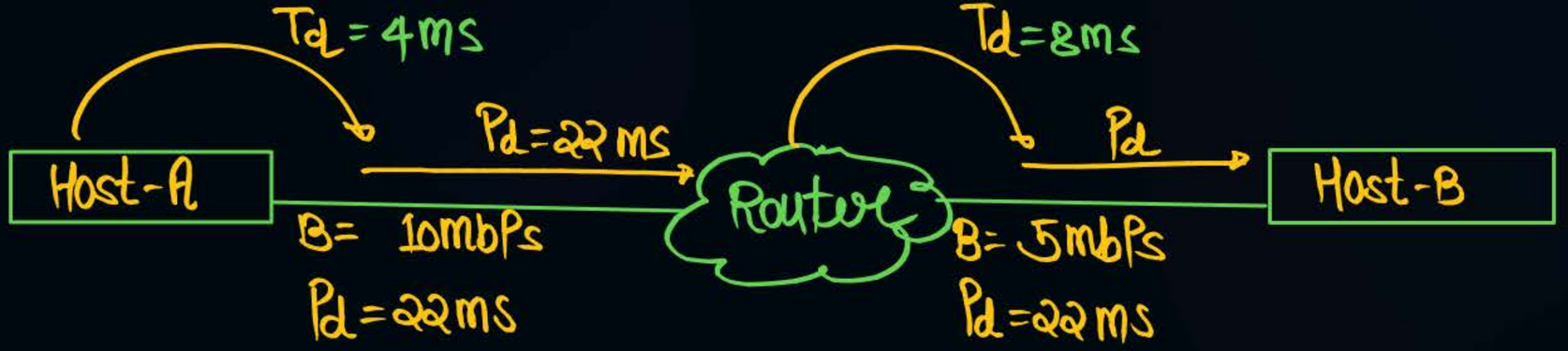
$10\frac{L}{R} + 10 + \frac{F}{R} - \frac{L}{R}$

$9\frac{L}{R} + 10 + \frac{F}{R}$

[NAT]

30KB (K → 10^3)

#Q. Hosts A and B are connected to each other via router R. R is a store-and-forward router. The bandwidth from A to R is 10Mbps, and the bandwidth from R to B is 5Mbps. The one-way latency of each link is 22ms. Assume host A sends a 30KB file to host B. assume each packet is acknowledged. The file is divided into 6 packets of the same size. How long would it take to send the entire file assuming that the sender cannot send a new packet before it receives an acknowledgment for the previous packet from the receiver B? (The transfer time is the time interval measure at source A from the time the first segment is sent until the acknowledgement of the last segment is received). Ignore the transmission time of the acknowledgements. 600(ms)



File size = 30KB

No. of Pkts(N) = 6

Packet size = $\frac{30KB}{6} = 5KB$

$T_d(Pkt)_{Host(A)} = \frac{Pkt\,size}{B} = \frac{5*10^3*8\ bits}{10*10^6\ bits/sec}$

$= 4*10^{-3}\ sec = 4ms$

$T_d(Pkt)_{Router} = \frac{Pkt\,size}{Bandwidth} = \frac{5*10^3*8\ bits}{5*10^6\ bits/sec}$

$= 8*10^{-3}\ sec = 8\ msec$

Total time to transfer 1st Pkt = 4 + 22 + 8 + 22 = 56 msec

Time For Ack = 22 + 22 = 44 msec

Total time taken to transfer 1st successfully = 56ms + 44ms = 100 msec

" " " " " 6 Pkt successfully = 6 * 100 = 600 msec

[NAT]

#Q. What is the total time (time elapsed between the transmission of the first bit of data and the reception of the last bit of the data) required (in μs) to transfer three frames of size 5000-bit each back-to-back on a 1 Gbps (1Gbps = 10^9 bps) ethernet with three switches in the path? Assume that propagation delay each link is 10 μs and that the switch begins transmitting the packet after the first 128-bits have been received._____(Round off to two decimal places)

No. of Pkts/Frames (N) = 3

Frame size = 5000 bits

$T_d(\text{Frame}) = \frac{5000 \text{ bits}}{10^9 \text{ bits/sec}}$

$= 5 \times 10^{-6}$ sec = 5 μsec

No. of Hops (X) = 4

P_d = 10 μsec

For X → Hops and 'N' Packet

$$\text{Total time} = X[T_d + P_d] + X-1(Q_d + P_{qd}) + (N-1)T_d$$

$$4[5+10] + 3*.128 + 2*5$$

$$= 60 + 3*0.128 + 10$$

$$= 70.384$$

Delay at switch

$$= \frac{128 \text{ bits}}{10^9 \text{ bits/sec}}$$

$$= 128 * 10^{-9} \text{ sec}$$

$$= .128 * 10^{-6} \text{ sec}$$

$$= .128 \mu\text{sec}$$

2 mins Summary

Topic One IPv4

Topic Two

Topic Three

Topic Four

Topic Five

THANK - YOU

CS & IT ENGINEERING

Computer Network

1500 Series

Lecture No.- 08

By- Ankit Doyla Sir

Recap of Previous Lecture

Topic

Topic

Questions Practice

Topics to be Covered

- Topic — Common Data Questions
- Topic

Suppose nodes A and B are on the same Ethernet bus, and the propagation delay between the two nodes is 225-bit times. Suppose both A and B send frames of 1,500 bits (including all headers and preambles) exactly at the same time, the frames collide, and then A and B choose different values of K (A = 0 and B = 1) in the CSMA/CD algorithm. Assume the transmission rate is 10 Mbps; CSMA/CD with backoff intervals of multiples of 512-bits is used. If a node detect collision, then it sends a 48-bit jam signal of inform other nodes. Assuming no other node is active and transmission time of a data frame is negligible

H.W

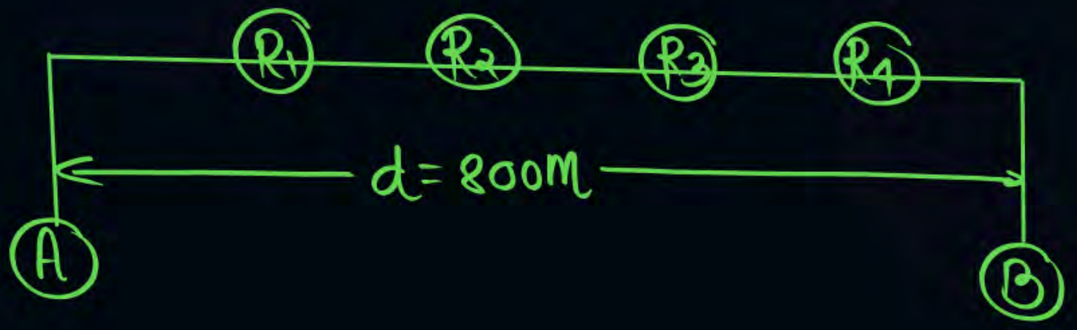
#Q. At what time (in microseconds) does A begin retransmission?

_____

#Q. At what time (in microseconds) does A's signal reach B?_____

[NAT]

Suppose two nodes, A and B, are attached to opposite ends of an 800m cable, and that they each have one frame of 1,500 bits (including all headers and preambles) to send to each other. Both nodes attempt to transmit at time t = 0. Suppose there are four repeaters between A and B, each inserting a 20-bit delay. Assume the transmission rate is 100 Mbps, and CSMA/CD with backoff intervals of multiples of 512 bits is used. After the first collision, A draws K = 0 and B draws K = 1 in the exponential backoff protocol. Assume that the signal propagation speed is 2×10^8 m/sec. What is the one-way propagation delay (including repeater delays) between A and B in microseconds (4.84 μsec)



Repeater delay = 20 bit

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

$$\text{Propagation delay} = \frac{d}{v} + \text{Repeater delay}$$

$$= \frac{800\text{m}}{2*10^8\text{m/sec}} + \frac{4*20\text{bits}}{100*10^6\text{bits/sec}}$$

$$= 4*10^{-6}\text{sec} + 0.8*10^{-6}\text{sec}$$

$$= 4\mu\text{sec} + 0.8\mu\text{sec} = 4.8\mu\text{sec}$$

Common Data Questions

The figure below illustrates a switched network. Consider a message that is $7.5 * 10^6$ bits long to be sent from the source to the destination. (Assume header size is negligible relative to the entire message size). Suppose each link is 1.5 Mbps and the propagation delay of each link is 10 milliseconds. Consider only transmission delays and propagation delay. Assume all other delay components are negligible and each switch uses store- and-forward packet switching.

msg size = $7.5 * 10^6$ bits

B = $1.5 * 10^6$ bits/sec

P_d = 10 msec

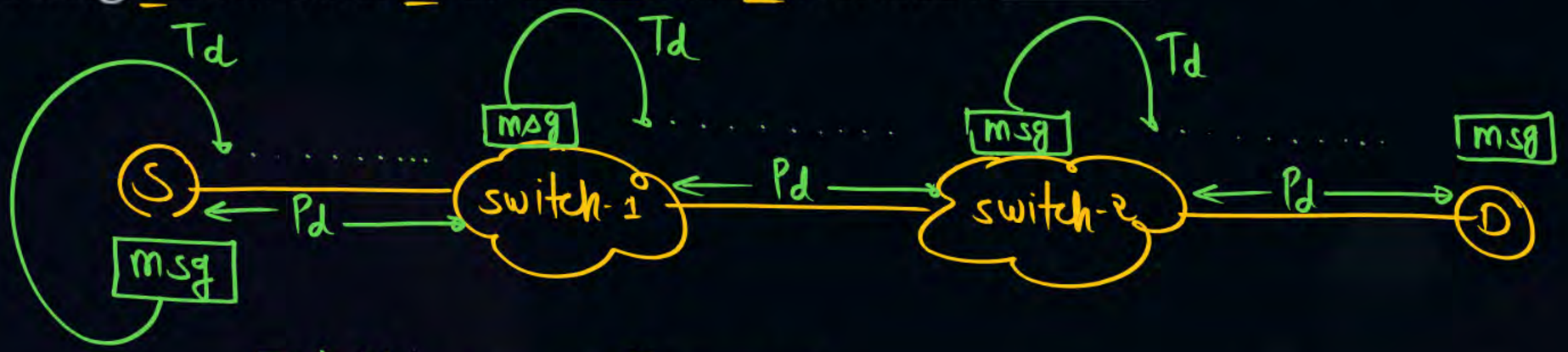
$$T_d = \frac{7.5 * 10^6 \text{ bits}}{1.5 * 10^6 \text{ bits/sec}}$$

T_d = 5 sec

T_d = 5000 msec

[NAT]

#Q. Consider sending the message from source to the destination without dividing into packets. What is the total time (in milliseconds) to move the message from source to the destination host?_____



Total time = 3*Td + 3*Pd

= 3*5000 + 3*10

15000 + 30 = 15,030

[NAT]

#Q. Now suppose that the message is divided into 5000 packets, with each packet being 1500 bits long. How long (in milliseconds) does it take to move the file from source host to destination host when message segmentation is used ? _____

No. of PKt (N) = 5000

PKt size = 1500 bit

$T_d(PKt) = \frac{1500 \text{ bits}}{1.5 * 10^6 \text{ bits/sec}}$

$= 1000 * 10^{-6}$ sec

$= 1$ msec

X → Hop & 'N' PKt

Total time $= X[T_d + P_d] + X-1(Q_d + P_{rd}) + (N-1)T_d$

$= 3[1 + 10] + 4999 * 1$

$= 33 + 4999 = 5032$ msec

[MCQ]

#Q. Assume that there are only two stations, A and B, in a CSMA/CD network. The distance between the two stations is 2000 meter, the propagation speed is 2×10^8 meter/sec, the transmission rate of a link is 100 Mbps ($1K = 10^3$, $1M = 10^6$ and $1G = 10^9$) and both stations have one frame of 2000 bits to send to each other. If station A starts transmission at time t1 then which of the following statement is/are true?

S1: The protocol does not allow station B to start transmitting at time t1 + 10μs. (False)

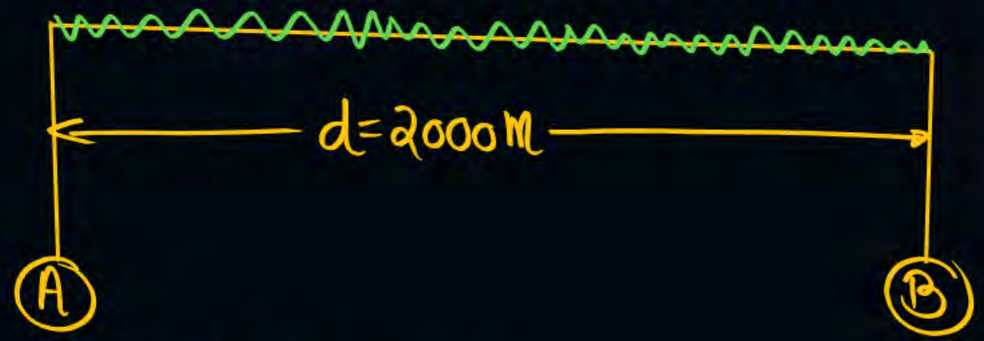
S2: The protocol does not allow station B to start transmitting at time t1+30μs. (T)

A Only S1

B Only S2

C Both S1 and S2

D Neither S1 nor S2



$t_1 \rightarrow$ A start transmission

$t_1 + 20\mu sec \rightarrow$ 'A' Finish its transmission

$t_1 + 20\mu sec + 10\mu sec \rightarrow$ 'A' Complete Packet reached at 'B'

$t_1 + 30\mu sec \longrightarrow$ " " " " " "

$V = 2 * 10^8$ m/sec, $B = 100 * 10^6$ bits/sec

$P_d = \frac{d}{v} = \frac{2000\,m}{2 * 10^8\,m/sec}$

$= 10 * 10^{-6}$ sec $= 10\mu sec$

Frame size = 2000 bits

$T_d(Frame) = \frac{2000\ bits}{100 * 10^6\ bits/sec}$

$= 20 * 10^{-6}$ sec $= 20\mu sec$

one bit transmission delay

$$T_d(\text{one bit}) = \frac{1 \text{ bits}}{100 * 10^6 \text{ bits/sec}}$$

$$= 0.01 * 10^{-6} \text{ sec}$$

$$= 0.01 \mu\text{sec}$$

At $t_1 + 0.01\mu\text{sec} + 10\mu\text{sec} = t_1 + 10.01\mu\text{sec}$ → 'A' First bit will reach at 'B'

[MCQ]

Sat → (20-25 Question)
(AL, RAlgorithm, IP Protocal)

#Q. The File Transfer Protocol (FTP) uses:

A. A persistent TCP connection on port 21 for a control session, and a separate non persistent TCP connection on port 20 for each data file transfer

B. A non-persistent TCP connection on port 21 for a control session, and a separate non persistent TCP connection on port 20 for each data file transfer

C. A persistent TCP connection on port 21 for a control session, and a single persistent TCP connection on port 20 for all of the data file transfers

D. A non-persistent TCP connection on port 21 for a control session, and a single persistent TCP connection on port 20 for all of the data file transfers.

[MCQ]

#Q. Consider the following protocols:

P_1 : TCP

P_2 : UDP

P_3 : ICMP

P_4 : IGMP

The order in which router eliminate the datagram from it's buffer is?

(P3) ICMP
↓
(P4) IGMP
↓
(P2) UDP
↓
(P1) TCP

$P_3 > P_4 > P_2 > P_1$

A $P_1 > P_2 > P_3 > P_4$

B $P_2 > P_1 > P_3 > P_4$

C $P_3 > P_4 > P_1 > P_2$

D $P_3 > P_4 > P_2 > P_1$ ✓

[MCQ]

#Q. A TCP connection is using a window size of 10,000 bytes, and the previous acknowledgement number was 22,001. It receives a segment with acknowledgement number 24,001 and window size advertisement of 10,000. What is the range of sequence number in the window after receiving acknowledgement segment?

A 22001 – 24000

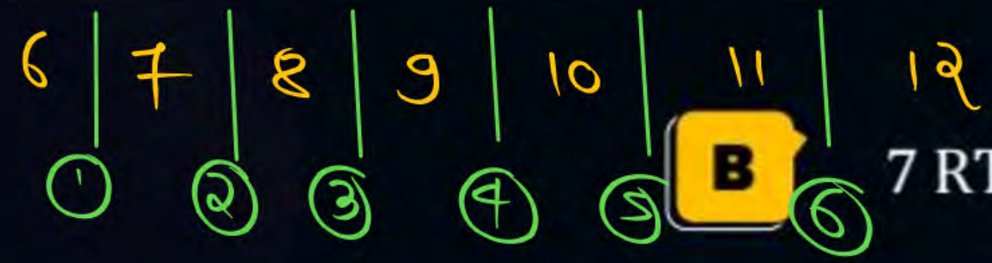
B 22001 – 32000

C 24001 – 34000

D 24001 – 36000

[MCQ]

#Q. Consider sending a large file from a host to another over a TCP connection that has no loss. Suppose TCP uses AIMD for its congestion control without slow start. Assuming cwnd increases by 1 MSS every time a batch of ACKs is received and assuming approximately constant round-trip times, how many RTTs would it take for cwnd increase from 6 MSS to 12 MSS (assuming no loss events)?



A 6 RTTs

B 7 RTTs

C 3 RTTs

D 12 RTTs

[MCQ]

Data for the next two question, timeline showing exchange of some segments between TCP A and TCP B during connection termination. X indicates that ACK segment was lost.

#Q. What are the states of TCP A at (1), (3) and (5) respectively?

A FIN_WAIT1, TIME_WAIT, FIN_WAIT2.

B FIN_WAIT1,CLOSE_WAIT, TIME_WAIT.

C FIN_WAIT1, FIN_WAIT2, TIME_WAIT.

D FIN_WAIT1, FIN_WAIT2, CLOSE_WAIT.

[MCQ]

#Q. What are the states of TCP B at (2) and (4) respectively?

A FIN_WAIT1, FIN_WAIT2

B CLOSE_WAIT, FIN_WAIT2

C CLOSE_WAIT, TIME_WAIT

D CLOSE_WAIT, LAST_ACK


closed
Starting Point
Passive open
Listen
Active open
Sent SYN
Rcvd SYN
Send SYN+Ack
Rcvd SYN
Send SYN+Ack
SYN-Sent
close (Timeout)
SYN-Rcvd
FIN(close)
Rcvd Ack
Send <Nothing>
data transfer
Rcvd SYN+Ack
Send Ack
established
Send FIN
Rcvd FIN
Send Ack
Rcvd FIN
Send Ack
FIN-Wait-1
closing
close-wait
simultaneous close
Rcvd Ack
Send <Nothing>
3 way Handshake
Rcvd FIN+Ack
Send Ack
Rcvd Ack
Send FIN
FIN-Wait-2
Rcvd FIN
Send Ack
Time wait
2*MSL
Last-Ack
Rcvd Ack

[MSQ]

#Q. The first Few Hexadecimal digits of TCP Header are given

S Port | D Port | S No

5EFA | 00 FD | 001C 3297

Which of the following statement is/are correct ?

A. Source port =24314 & Destination port =253

B. Source port =20480 & Destination port =253

C. Packet is going from client to server

D. Packet is going server to client

$S.Port = (5EFA)_{16}$

$16^3\ 16^2\ 16^1\ 16^0$

$= 5*16^3 + 14*16^2 + 15*16^1 + 10*16^0$

$= 24314$

$D.Port = (00FD)_{16}$

$16^1\ 16^0$

$15*16 + 13 = 253$

Well Know Port No (0-1023)

[NAT]

#Q. Consider the 1 Gbps CSMA/CD broadcasts star in which no two hosts are now more than 500m apart, The CSMA/CD specification requires that if a collision occurs, it must detect the collision before it finishes transmitting a packet.
What is the size of the minimum packet in above network (in bytes)? (Assume the speed of propagation is 2×10^8 m/s.)_____

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Common Data Questions

THANK - YOU

CS & IT ENGINEERING

Computer Network

1500 Series

Lecture No.- 09

By- Ankit Doyla Sir

Recap of Previous Lecture

Topic

Topic

Questions Practice

Topics to be Covered

- Topic — Common Data Questions
- Topic

Suppose two nodes, A and B, are attached to opposite ends of an 1200m cable, and that they each have one frame of 1,500 bits (including all headers and preambles) to send to each other. Both nodes attempt to transmit at time t=0. Suppose there are four repeaters between A and B, each inserting a 40-bit delay. Assume the transmission rate is 100 Mbp, and CSMA/CD with backoff intervals of multiples of 512 bits times is used. After the collision, A draws K=0 and B draws K=1 in the exponential backoff protocol. Ignore the jam signal in this case.

#Q. What is the one-way propagation delay (including repeater delays) between A and B in seconds? Assume the signal propagation speed is $2*10^8$ m/sec.

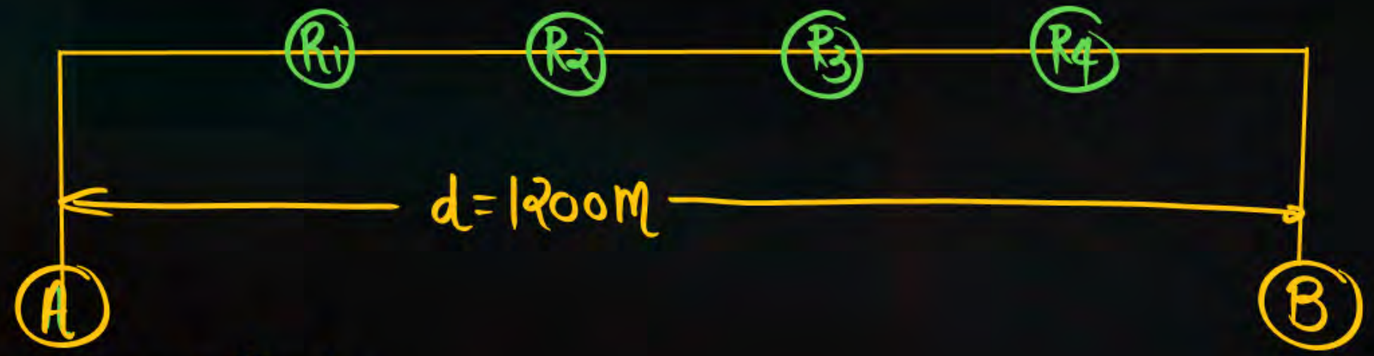
micro

#Q. At what time (in seconds) is A's packet completely delivered at B?

micro

#Q. At what time (in microsec) 'A' retransmission 1st bit will reach at 'B'

$15 \cdot 2 + 7 \cdot 6 = 72 \cdot 8$



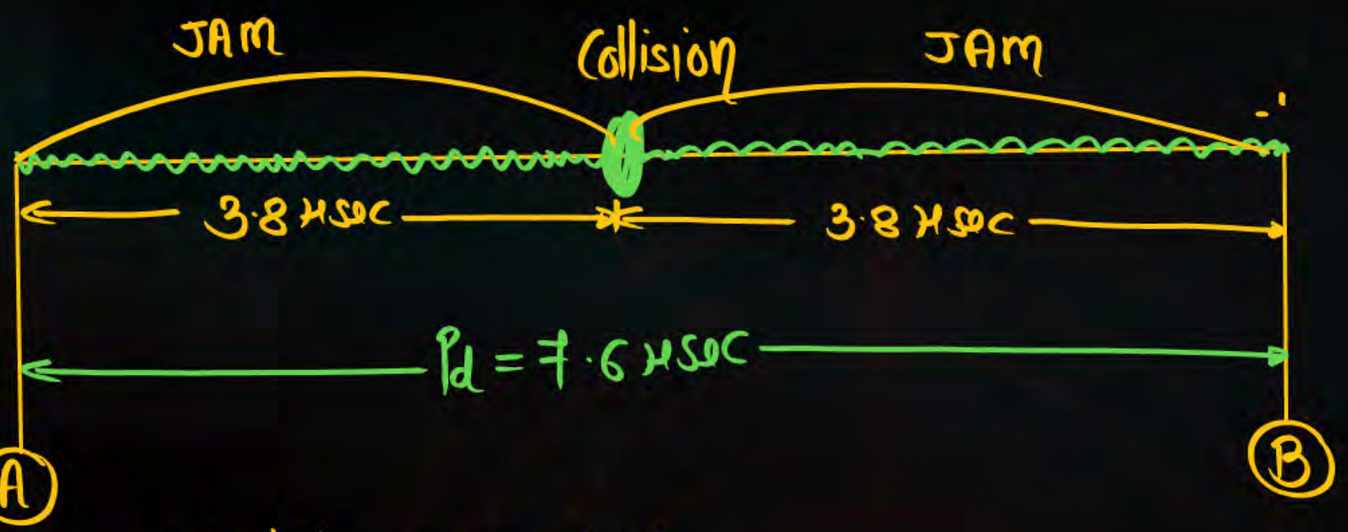
$v = 2 * 10^8$ m/sec

$$P_d \text{ (including Repeater delay)} = \frac{d}{v} + \text{Repeater delay}$$

$$= \frac{1200 \text{ m}}{2 * 10^8 \text{ m/sec}} + \frac{4 * 40 \text{ bit}}{100 * 10^6 \text{ bits/sec}}$$

$$= 6 * 10^{-6} \text{ sec} + 1.6 * 10^{-6} \text{ sec}$$

$$= 6 \mu\text{sec} + 1.6 \mu\text{sec} = 7.6 \mu\text{sec}$$



$T_t = \frac{\text{Pkt size}}{\text{Bandwidth}}$

$= \frac{1500 \text{ bits}}{100 * 10^6 \text{ bits/sec}}$

$= 15 * 10^{-6}$ sec $= 15$ μsec

At $t = 0$ Both 'A' and 'B' starts

At $t = 3.8$ μsec ⟶ Both 'A' and 'B' data collide

At $t = 7.6$ μsec ⟶ Both 'A' and 'B' detect the collision

$K = 0$

$WT = P_d = 7.6$ sec

$K = 1$

$WT = K *$ slot duration

$WT = 1 * 512$ bits

At $t = 7.6 + 7.6 = 15.2$ μsec 'A' start retransmitting the data

At $t = 15.2\ \mu sec + 15\ \mu sec = 30.2$ 'A' Finished its transmission

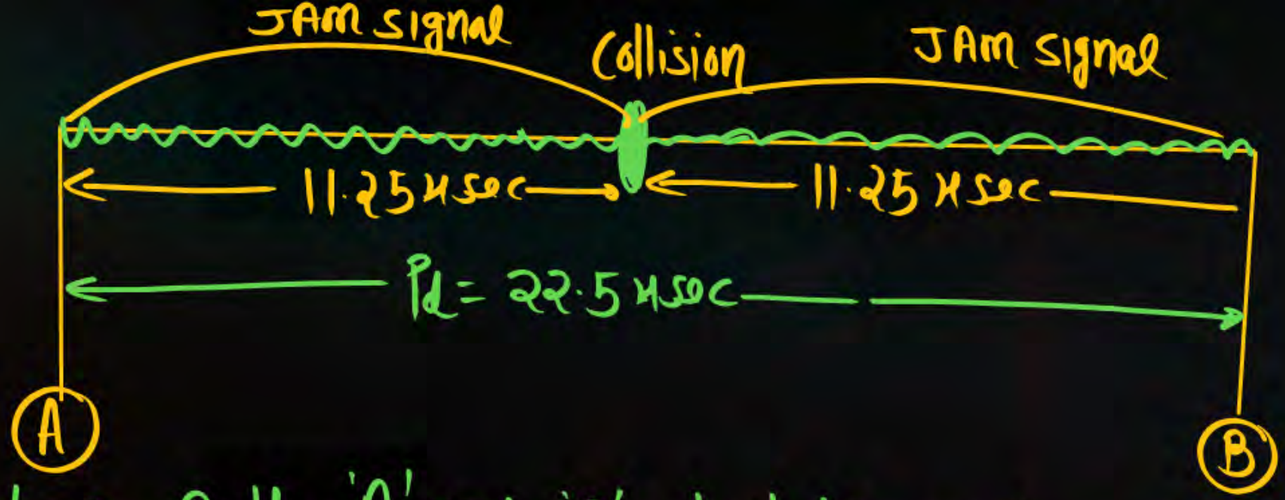
At $t = 30.2 + 7.6\ \mu sec = 37.8\ \mu sec$ 'A' Packet completly delievered at 'B'

Suppose nodes A and B are on the same Ethernet bus, and the propagation delay between the two nodes is 225-bit times. Suppose both A and B send frames of 1,500 bits (including all headers and preambles) exactly at the same time, the frames collide, and then A and B choose different values of K (A = 0 and B = 1) in the CSMA/CD algorithm. Assume the transmission rate is 10 Mbps; CSMA/CD with backoff intervals of multiples of 512-bits is used. If a node detect collision, then it sends a 48-bit jam signal of inform other nodes. Assuming no other node is active and transmission time of a data frame is negligible

#Q. At what time (in microseconds) does A begin retransmission?

_____

#Q. At what time (in microseconds)A's packet completely delivered at B?_____



$P_d = \frac{225 \text{ bit}}{10 * 10^6 \text{ bits/sec}}$

$= 22.5 * 10^{-6} \text{ sec} = 22.5 \mu\text{sec}$

At $t = 0$ Both 'A' and 'B' start transmitting data

At $t = 11.2 \mu\text{sec}$ Both 'A' and 'B' data Pkt collide

At $t = 11.25 + 4.8 + 11.25 = 27.3$ Both 'A' and 'B' detect collision

$K = 0$

$WT = P_d = 22.5 \mu\text{sec}$

$K = 1$

At $t = 27.3 + 22.5 = 49.8 \mu\text{sec}$ 'A' start its retransmission

$T_d(\text{JAM signal}) = \frac{\text{JAM signal size}}{\text{Bandwidth}}$

$= \frac{48 \text{ bits}}{10 * 10^6 \text{ bits/sec}}$

$= 4.8 * 10^{-6} \text{ sec}$

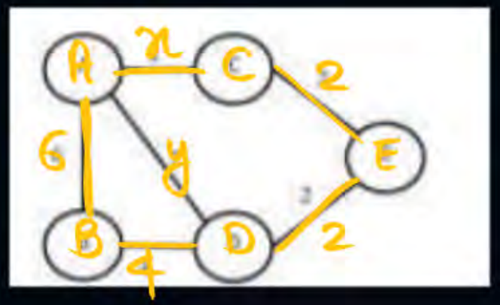
$= 4.8 \mu\text{sec}$

At t = 49.8 + 150 = 199.8 μsec 'A' Finish its transmission $T_d(PKt) = \frac{PKt\ size}{Bandwidth}$

At t = 199.8 + 22.5 = 222.3 'A's PKt completly delicvered at 'B' $= \frac{1500\ bits}{10*10^6\ bits/sec}$

$= 150*10^{-6}\ sec = 150\ \mu sec$

Consider the following network



$x+x+y < x+2+2$

$x+y < 4$

Which of the following condition must be satisfied to ensure that traffic from B to C will always Flow through node A?

(a) $x > 4$

(b) $y + x < 6$

(c) $y + x < 4$

(d) $x < 4$

The network uses a Distance Vector Routing protocol to compute the distances and next hops between different node pairs. Given the initial distance vector table after first round of distance vector exchange

MCQ

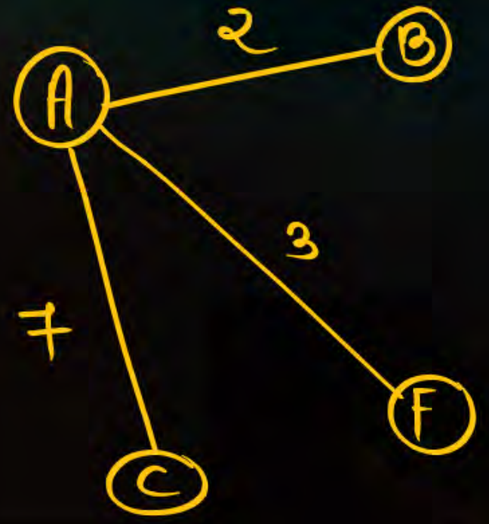
Information Stored at Node	Distance to Reach Node						
	A	B	C	D	E	F	G
A	0	2	7	∞	∞	3	∞
B	2	0	4	∞	∞	∞	∞
C	7	4	0	∞	2	∞	∞
D	∞	∞	∞	0	10	1	∞
E	∞	∞	2	10	0	∞	2
F	3	∞	∞	1	∞	0	1
G	∞	∞	∞	∞	2	1	0

Each distance vector is the distance of the best known path at that instance to nodes, A to G, where the distance to itself is 0. Also, all links are symmetric and the cost is identical in both directions. In each round, all nodes exchange their distance vectors with their respective neighbours. Then all nodes update their distance vectors. In between two rounds, any change in cost of a link will cause the two incident nodes to change only that entry in their distance vectors. The distance vector table entries of node A after second round of distance vector exchange with its neighbours is

	A	B	C	D	E	F	G
(a)	0	2	7	4	∞	3	4
(b)	0	2	6	4	9	3	4
(c)	0	2	6	4	∞	3	4
(d)	0	2	6	4	8	3	4

At A

'A' Rcvd DV From B, C, F



From B	From C	From F
2	7	3
0	4	∞
4	0	∞
∞	∞	1
∞	2	∞
∞	∞	0
∞	∞	1
AB=2	AC=7	AF=3

0+2=2
4+2=6
∞+2=∞
∞+2=∞
∞+6=∞

4+7=11
0+7=7
∞+7=∞
2+7=9
∞+7=∞
∞+7=∞

∞+3=∞
1+3=4
∞+3=∞
0+3=3
1+3=4

New Routing table of 'A'

Dest.	Dis.	NH
A	0	A
B	2	B
C	6	B
D	4	F
E	9	C
F	3	F
G	4	F

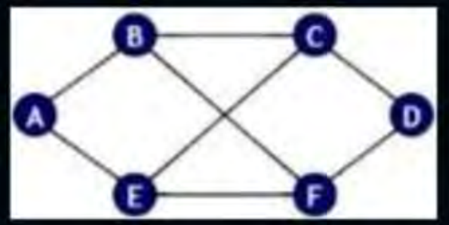
NAT

How many statements about link state routing protocol is/are TRUE?

1. Routing messages from a router should be forwarded to all other routers in its area. (True)
2. Routers build a complete picture of the whole network and compute shortest LS paths locally. (True)
3. Suffers from the "count to infinity" problem. DVR suffers from count to infinity Not LSR (False)
4. Does not prevent routing loops. DVR does Not Prevent Routing loops & Not LSR (False)
5. Typically uses Dijkstra's shortest path algorithm. (True)

[MCQ]

Consider the following network, which utilize the Distance vector routing:



F New Routing table

Dest.	Dis.	NH
A	9	B
B	6	B
C	8	
D		
E		
F	0	F

Router F has the following routing table:
A: ∞, B: 6, C: ∞, D: 3, E: 5, F: 0
The following vectors have just come in to router F:
From B: A: 3, B: 0, C: 8, D: 12, E: 6, F: 2
From D: A: 16, B: 12, C: 6, D: 0, E: 9, F: 10
From E: A: 7, B: 6, C: 3, D: 9, E: 0, F: 4
What is F's new routing table?

(a) A: ∞, B: 6, C: ∞, D: 3, E: 5, F: 0
(b) A: 9, B: 6, C: 9, D: 3, E: 5, F: 8
(c) A: 9, B: 6, C: 8, D: 3, E: 5, F: 0
(d) A: 9, B: 6, C: 9, D: 3, E: 5, F: 0

At F

F Rcvd DV From B, D, E

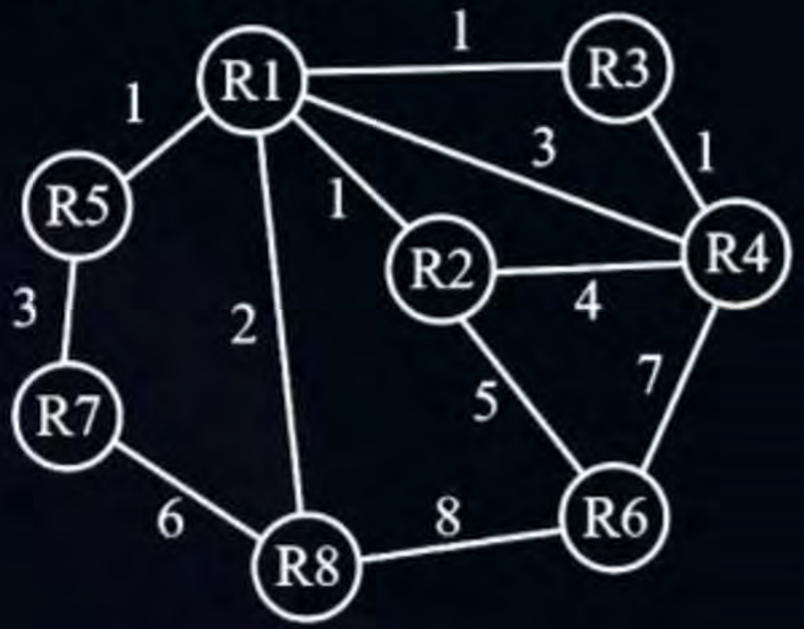
From B: 3, 0, 8, 12, 6, 2 → FB = 6 → 8+6 = 14

From D: 16, 12, 6, 0, 9, 10 → FD = 3 → 6+3 = 9

From E: 7, 6, 3, 9, 0, 4 → FE = 5 → 3+5 = 8

[MCQ]

Consider a network with 8 routers R1 to R8 connected with links having weight shown in the following diagram:



Routing table of R2

Dest	Dis	NH
R1	1	
R2	0	
R3	2	
R4		
R5		
R6		
R7		
R8		

All the routers uses the distance vector based routing algorithm to update their routing tables. Each router starts with its routing table initialized to contain an entry for each neighbour with the weight of the respective connecting link. After all the routing tables stabilize, then what will be the routing table at router R2?

A

R1	R2	R3	R4	R5	R6	R7	R8
1	0	5	4	2	5	5	3

B

R1	R2	R3	R4	R5	R6	R7	R8
1	0	2	3	2	5	5	3

C

R1	R2	R3	R4	R5	R6	R7	R8
1	0	5	4	2	5	4	3

D

R1	R2	R3	R4	R5	R6	R7	R8
1	0	4	5	2	5	4	3

Consider the following statements about the protocols:

S_1: HTTP and FTP both are In-band protocol

S_2: HTTP is stateful and FTP is stateless protocol

S_3: HTTP is stateless but FTP is stateful protocol

S_4: HTTP and FTP both are out of band protocol

Which of the above statements are correct?

A S_1

B S_2

C S_3

D S_4

Stateless	StateFull
DNS	POP
SMTP	IMAP
HTTP	FTP

In-Band	out of Band
DNS, SMTP, HTTP, IMAP POP	FTP

2 mins Summary

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Common Data Questions

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