CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Header & Fragmentation

Lecture No-07

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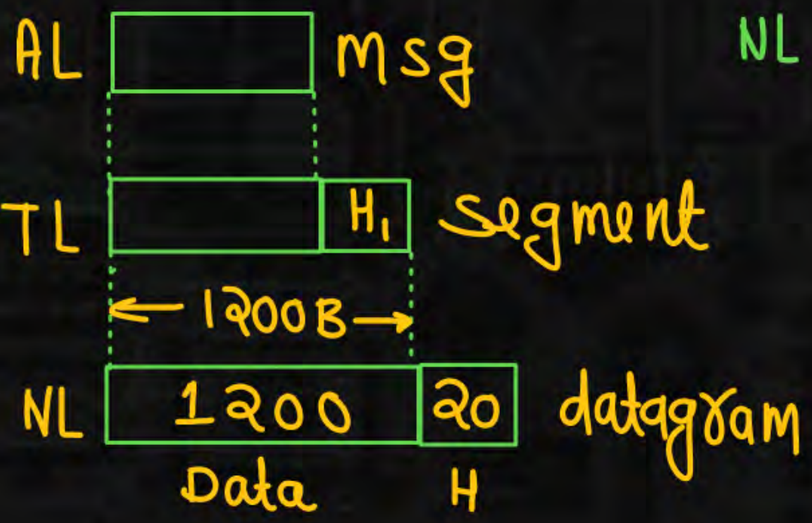
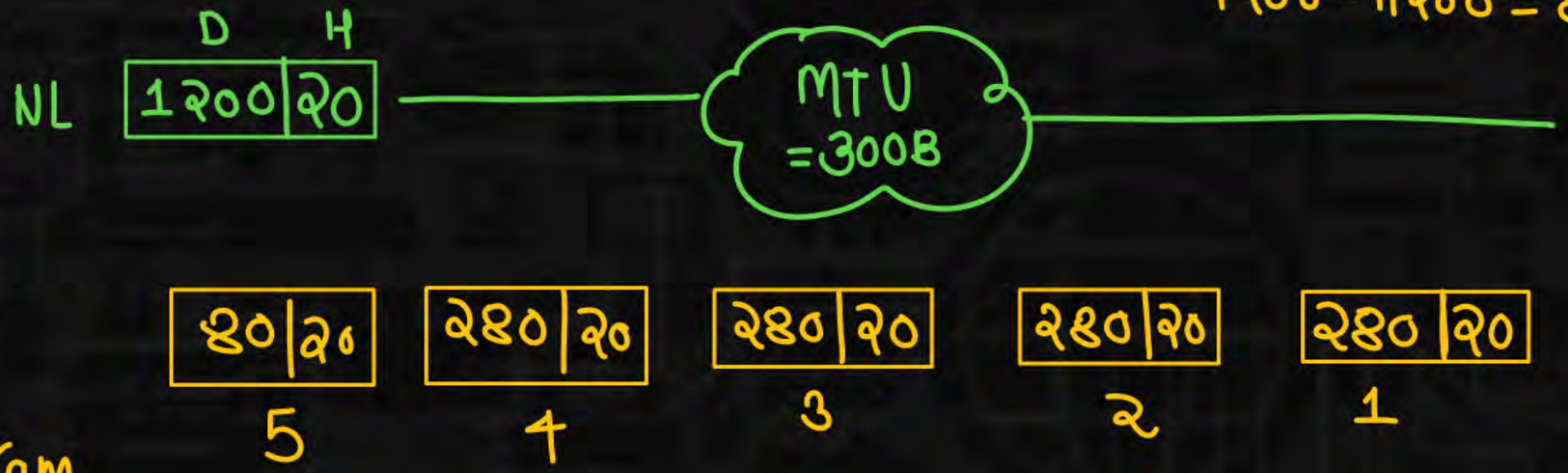
Fragmentation in IPv4

Q.11 Consider transport layer packet (PDU) size is 1200 Bytes, IP(V4) Header size is 20 Bytes and MTU is 300 Bytes then number of IP fragments is __5__ .

280*4 = 1120

1200 - 1120 = 80

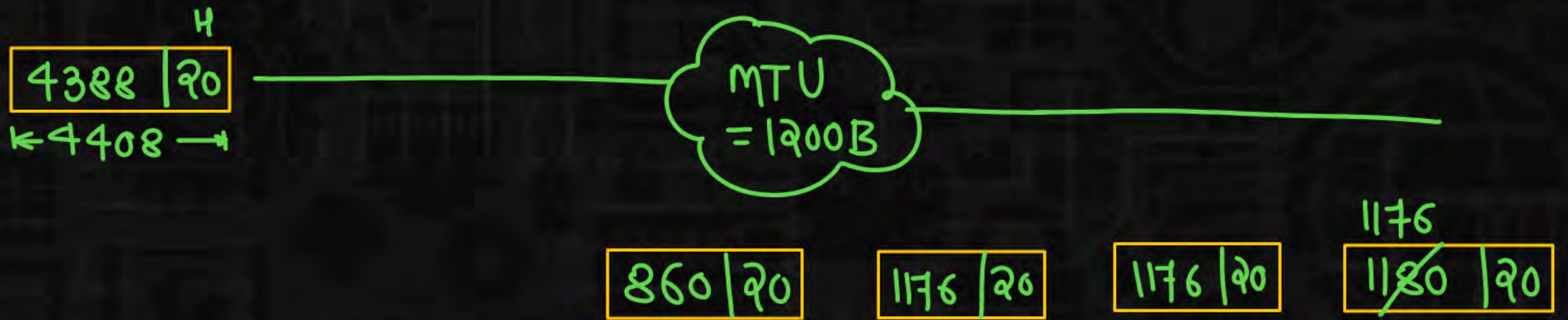




Q.12 An IP router with MTU of 1200 byte has received an IP packet of size 4408 byte with an IP Header of 20 byte. What is the total length value of the Last Fragment 880

1176 × 3 = 3528

4388 − 3528 = 860



Total length = 880

Q.13

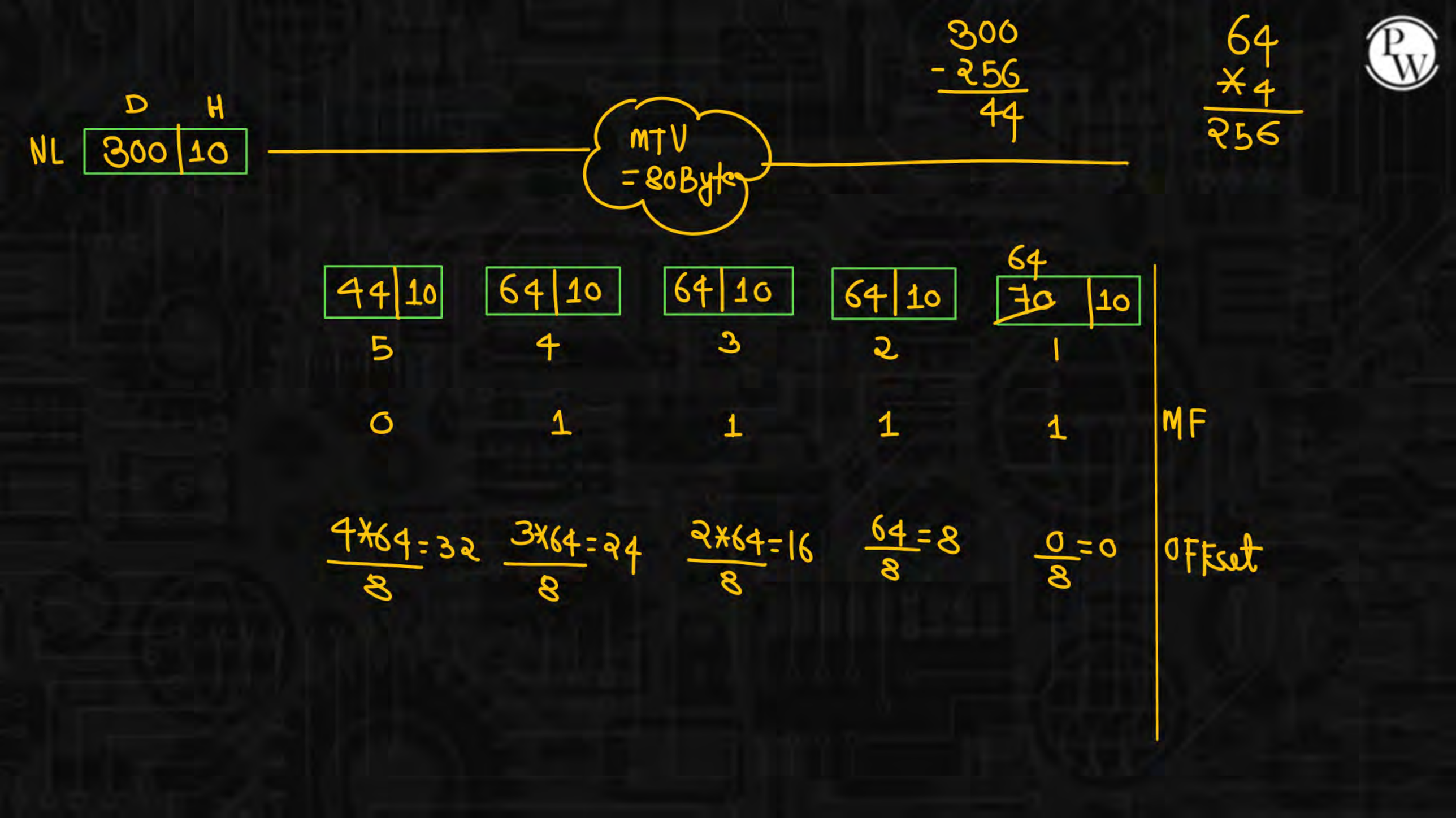
If a router receives an IP packet containing 300 data byte and has to forward the packet to the network with maximum transmission unit of 80 byte. Assume that IP header is 10 byte long. Find the total fragment, more Fragment, and offset values.

A. 4, 1110 (0, 10, 20, 30)

B. 5, 11110 (0, 8, 17, 26, 35)

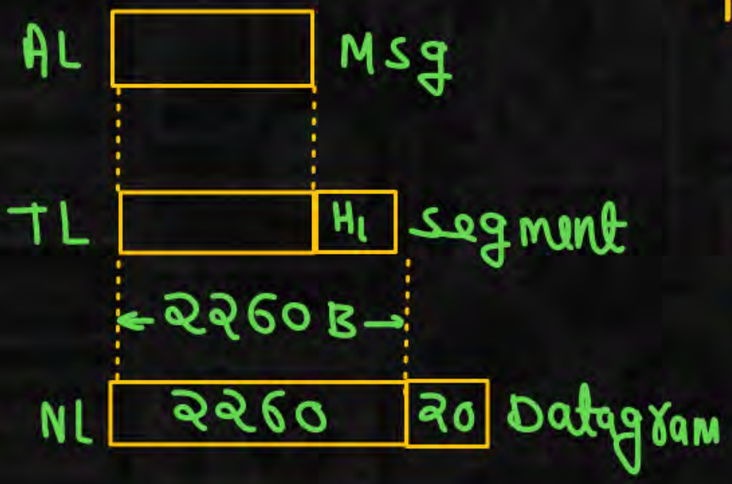
C. 6, 111110 (0, 7.5, 15, 22.5, 30)

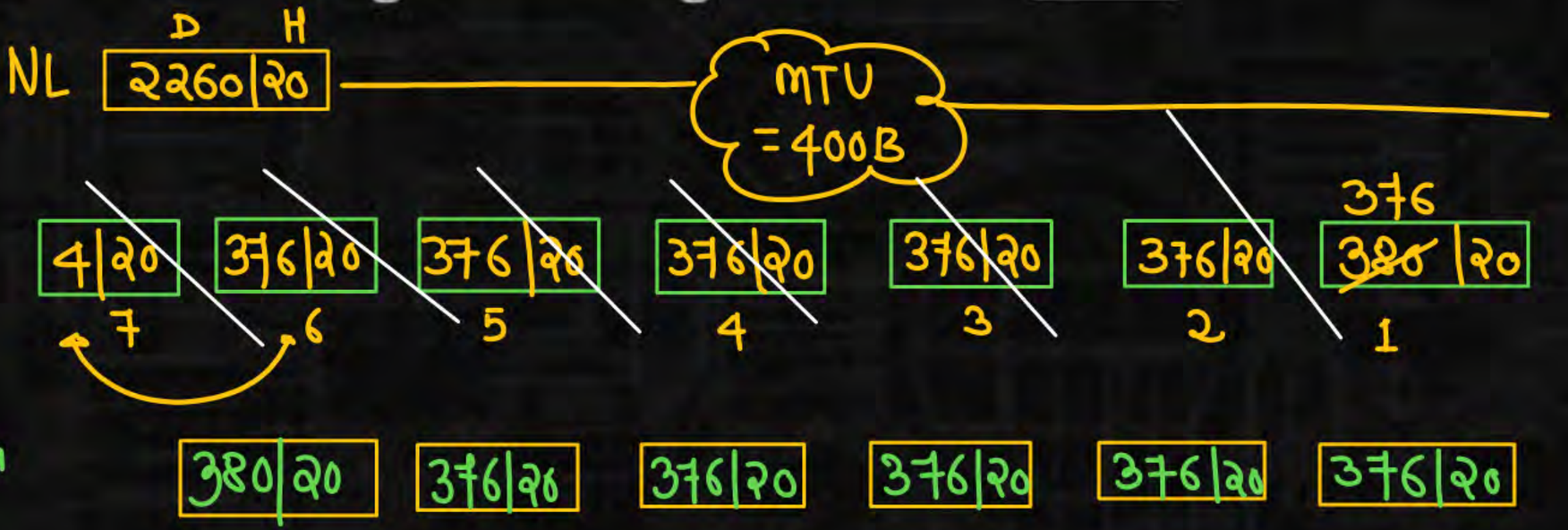
D. 5, 11110 (0, 8, 16, 24, 32)


300
-256
44
64
*4
256
D
H
NL
300
10
MTV
=80Byte
44
10
64
10
64
10
64
10
64
70
10
5
4
3
2
1
0
1
1
1
1
MF
4*64=32
8
3*64=24
8
2*64=16
8
64=8
8
0=0
8
Offset

Q.14 *

Consider PDU size of transport layer packet is 2260 Bytes at source host. MTU for the network is 400 Bytes and IP(V4) header size is 20 Bytes the number of Fragments for given PDU is 6.



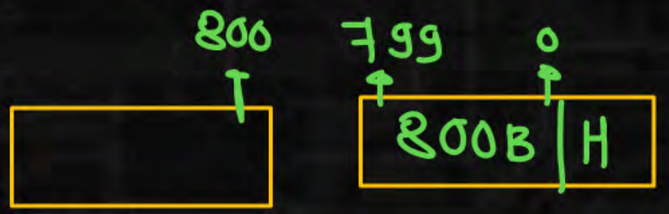


No. of Fragments $= \frac{2260}{376} = \lceil 6.01 \rceil = 7$ Fragm.

Q.15 A packet has arrived in which the offset value is 100. what is the number of first byte _____

OFFset = 100

No. of data Byte ahead = 8 * 100 = 800



Q.16

Consider the following fields in IP header and choose correct combination :

P.	MF	1.	Zero for first fragment
Q.	DF	2.	It must be available in all fragments
R.	Offset	3.	If it is '1', then fragmentation is not allowed
S.	Strict source routing	4.	zero for last fragment

A. P-3, Q-1, R-4, S-2

B. P-2, Q-3, R-1, S-4

C. P-4, Q-3, R-1, S-2

D. P-4, Q-3, R-2, 3-1

Q.17

Why do you think IP4 has fragment reassembly done at the end point, rather than at the next hop router ?

MCQ

A. Fragment may follow the same route

B. Fragments may follow the different routes

C. Different networks will have the same MTU size

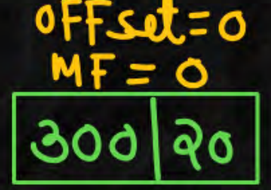
D. Intermediate routers do not know the reassemble algorithm

Q.18 In an IPv4 datagram, M bit is zero and fragment offset value is zero, then the fragment is ____.

MCQ

M=0 → Last Fragment or only Fragment

OFFset = 0 → First Fragment



A. First Fragment

B. Last Fragment

C. Middle Fragment

D. No fragmentation ✓

Q.19 In an IPv4 datagram, M bit is one. then the fragment is ____. MCQ

A. First Fragment

B. Last Fragment

C. Middle Fragment

D. Both A and C ✓

M = 1 → It can't be Last Fragment

↓

It can be First Fragment, 2nd Fragm ... or middle Fragment

Q.20

A packet has arrived in which the offset value is 100 ,the value of HLEN is 5 and the value of total length is 100. what is the number of last byte 879

Q.21

Find number of fragments while packet traverse through a network with below details in incoming packet header and network characteristics. Maximum transport unit (MTU) size as 300 bytes, network header as 20 bytes, don't fragment (DF) bit as 1 and incoming datagram data size as 1000 bytes.

A. 3 fragment

B. 2 fragments

C. 4 fragments

D. None of the above ✓

DF = 1 → Datagram can't be Fragment

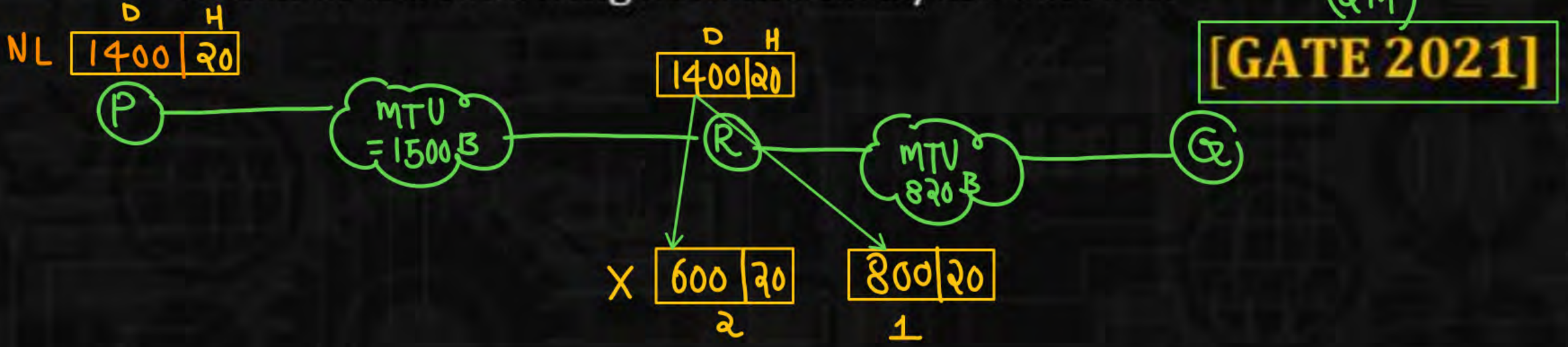
Q.22 Consider two hosts P and Q connected through a router R. The maximum transfer unit (MTU) value of the link between P and R is 1500 bytes, and between R and Q is 820 bytes.

A TCP segment of size 1400 bytes was transferred from P to Q through R, with IP identification value as 0x1234. Assume that the IP header size is 20 bytes. Further, the packet is allowed to be fragmented, i.e., Don't Fragment (DF) flag in the IP header is not set by P.

Which of the following statements is/are correct?

(2 M)

[GATE 2021]



A. If the second fragment is lost, P is required to resend the whole TCP segment.

B. If the second fragment is lost, R will resend the fragment with the IP identification value 0x1234.

C. Two fragments are created at R and the IP datagram size carrying the second fragment is 620 bytes.

D. TCP destination port can be determined by analysing only the second fragment.

Q.23 Consider the following statements about the functionality of an IP based router.

Router can modify the IP PKt. TTL value is decremented by one on each & every Router

(F) I. A router does not modify the IP packets during forwarding.

(T) II. It is not necessary for a router to implement any routing protocol.

(F) III. A router should reassemble IP fragments if the MTU of the outgoing link is larger than the size of the incoming IP packet.

Reassamble is Always done by the destination

Which of the above statements is/are TRUE ?

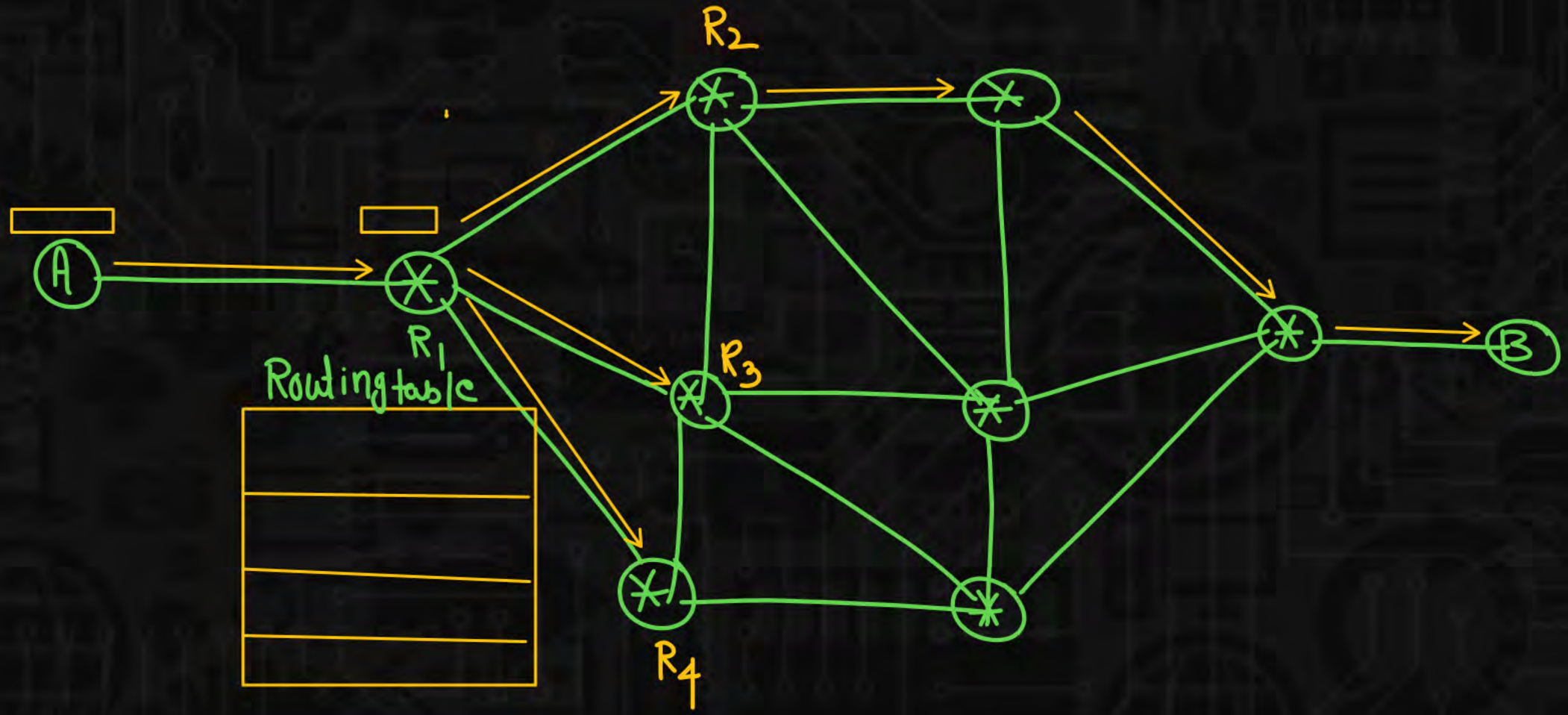
[GATE 2020]

A. I and II only

B. I only ✓

C. II and III only

D. II only


R2
A
R1
Routing table
R3
B
R4

Q.24 An IPV_4 datagram is received by an IPv4 Router, Header length (HLEN) field contains value 10 and total length field contains value 2060, MTU of the link is 100 bytes. Calculate total number of IP fragments after fragmentation 36.

HLEN = 10

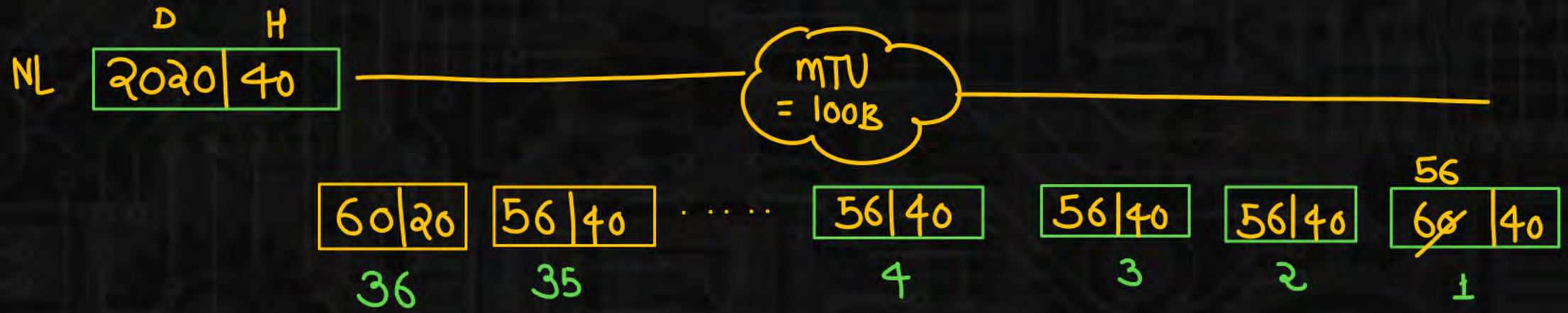
Header size = 10*4 = 40B

TL = 2060

D+H = 2060

D = 2060 - 40

Data = 2020



56*35 = 1960

2020-1960 = 60

Q.25

An IPv4 datagram has arrived in which the offset value is 800, the HLEN is 8, and the value of total length field is 500 and M bit is 0.

What are the numbers of the 1st Byte and the last Byte and the position of the datagram?

H·W

A. 6400, 6887 and Last Fragment

B. 6400, 6867 and First Fragment

C. 6400, 6867 and Last Fragment

D. 801, 1268 and First Fragment

Q.26

An IP router with MTU of 1200 Bytes has received an IP packet of size 4408 byte with an IP header of 20 byte. The value of the MF, offset, and total length of the 4th fragment

H·W

A. MF = 1, Offset = 404, Total length = 880

B. MF = 0, Offset = 294, Total length = 1196

C. MF = 0, Offset = 441, Total length = 880

D. MF = 0, Offset = 404, Total length = 1196

Q.27

Consider three IP Networks A, B and C. Host H_A in network each containing 180 bytes of application data to a host H_C in network C. The TCP layer prefixes 20 bytes header to the message.

This passes through an intermediate network B. The maximum packet size, including 20 bytes IP header, in each network is:

A: 1000 bytes ✓

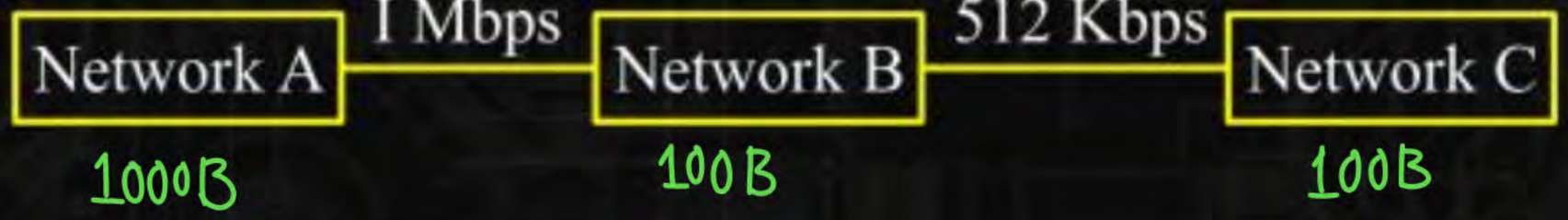
B: 100 bytes ✓

C: 1000 bytes ✓

Gate 2004

4M = 2M + 2M

The network A and B arc connected through a 1 Mbps link, while B and C arc connected by a 512 Kbps link (bps = bits per second).



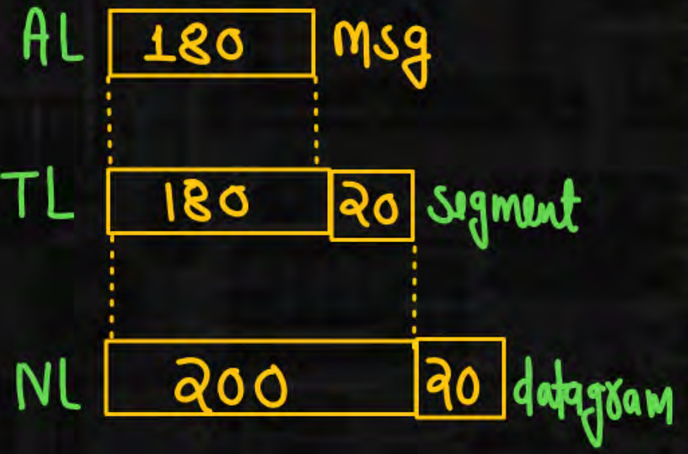
Assuming that the packets are correctly delivered, how many bytes, including headers, are delivered to the IP layer at the destination for one application message, in the best case? Consider only data packets.

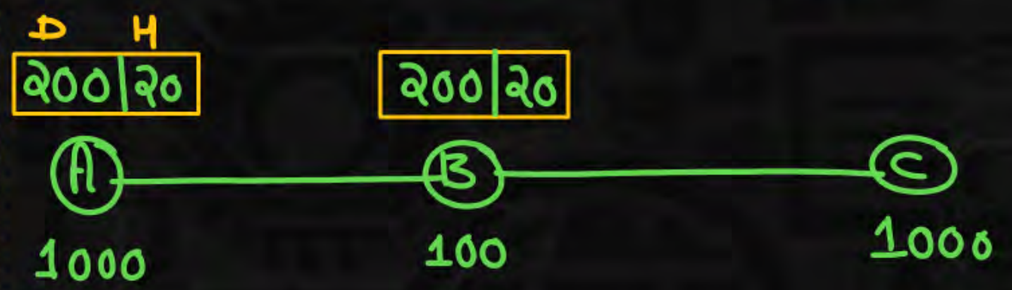
A. 200

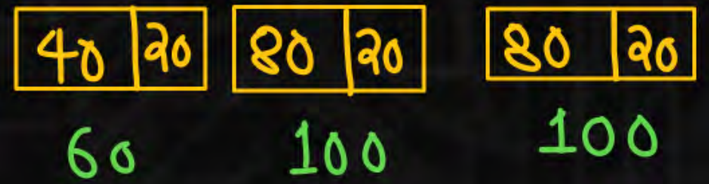
B. 220

C. 240

D. 260 ✓







100 + 100 + 60 = 260

Q.28

Consider three IP networks A, B and C. Host H_A in network A sends messages each containing 180 bytes of application data to a host H_C in network C. The TCP layer prefixes 20 byte header to the message. This passes through an intermediate network B. The maximum packet size, including 20 byte IP header, in each network, is:

A : 1000 bytes

B : 100 bytes

C: 1000 bytes

The network A and B are connected through a 1 Mbps link, while B and C are connected by a 512 Kbps link (bps = bits per

What is the rate at which application data is transferred to host HC? Ignore errors, acknowledgments, and other overheads.

A. 325.5 Kbps

B. 354.5 Kbps ✓

C. 409.6 Kbps

D. 512.0 Kbps

Throughput = $\eta * B$

$$\text{efficiency} = \frac{\text{useful Byte}}{\text{total Byte}} = \frac{180}{960}$$

$$\text{Throughput} = \frac{180}{960} * 512 \text{ Kbps}$$

Throughput = 354.5 Kbps

Q.29

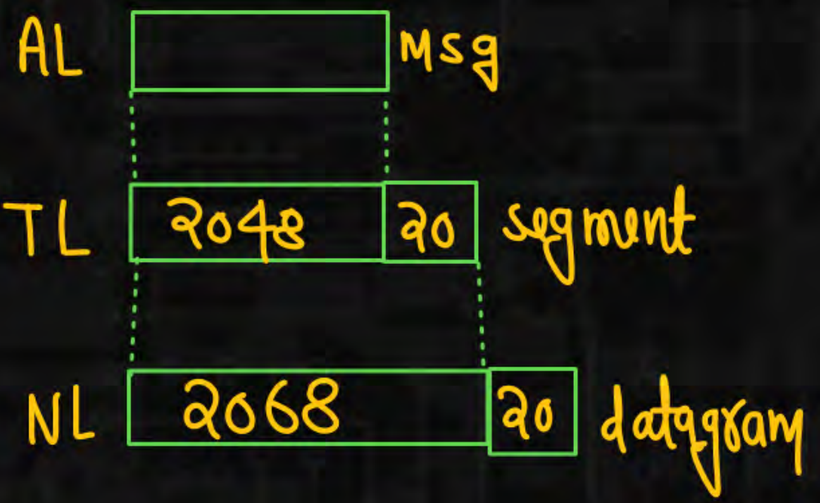
Suppose a TCP message that contains 2048 bytes of user data and 20 byte of TCP Header is passed to IP for delivery across two Networks of the Internet. The first Network uses MTU 1024 Byte and second Network uses MTU 512 byte. Each Network's MTU gives the size of Largest IP datagram that can be carried in a Link Layer Frame. Assume all IP Headers are 20 bytes. How many Fragments are received by destination and what is the offset value of 6th Fragments –

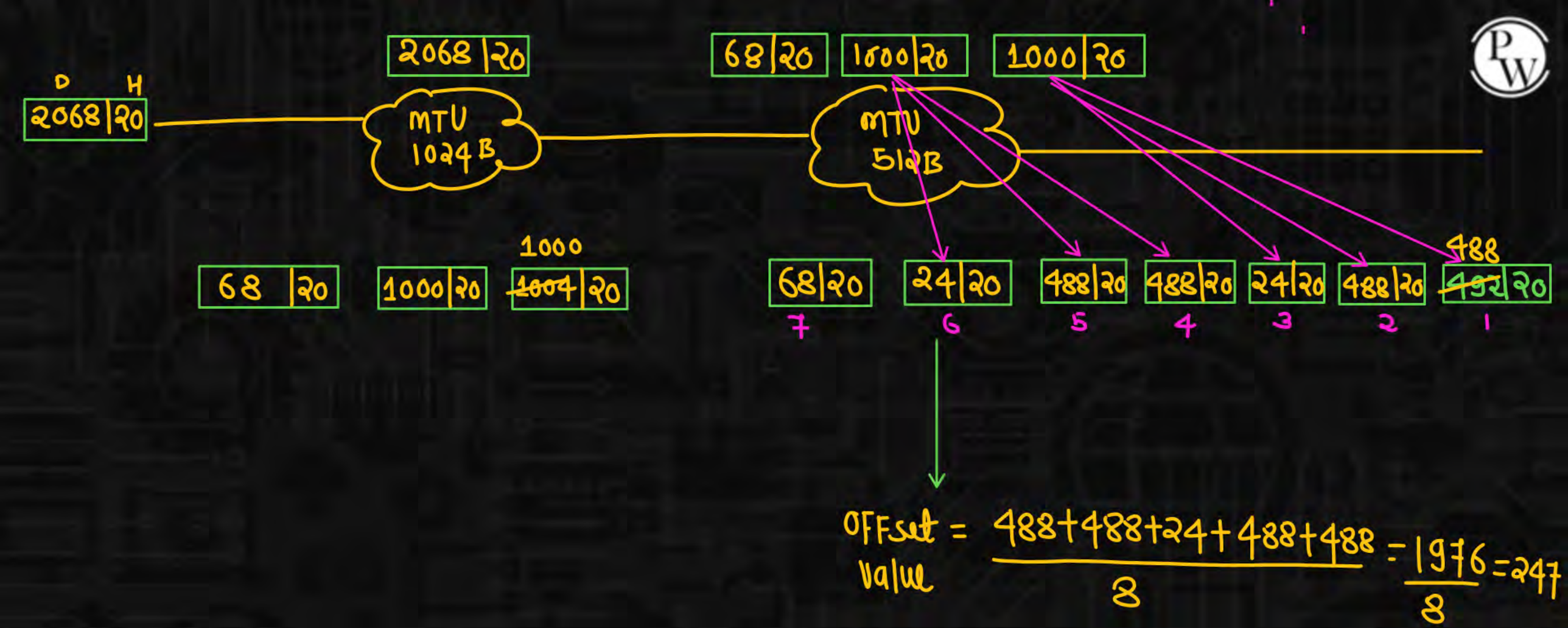
A. 3,186

B. 7,247

C. 7,1976

D. 7,1488

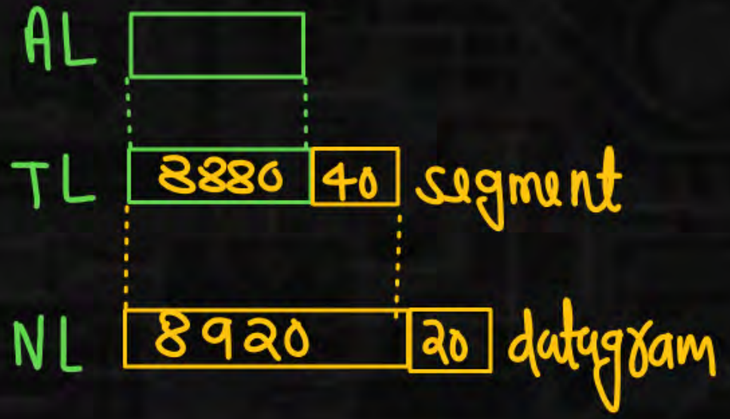




$$\text{OFFset Value} = \frac{488+488+24+488+488}{8} = \frac{1976}{8} = 247$$

Q.30

Host a send a TCP packet containing 8880 byte of user data to Host-B over an ethernet LAN. Ethernet LAN frames may carry data upto 1500 byte (i.e. MTU = 1500 Byte) size of TCP Header is 40 byte and size of IP Header is 20 byte. How many total no. of Fragment will be transmitted, what is offset value of last fragment and what is the total length of last fragment



A. 6, 925, 40

B. 7, 1110, 60 ✓

C. 7, 1110, 40

D. 6, 1110, 1480


D
H
NL
४७२०
२०
MTU
= 1500 B


THANK YOU
GW
SOLDIERS !