

WEEKLY TEST – 06

Subject : Computer Networks

Topic : IPv4 and Fragmentation



Maximum Marks 15

Q.1 to 5 Carry ONE Mark Each

[MCQ]

1. A datagram of 7000 byte (20 bytes IP header) + (6980 bytes IP payload) reach at a router and must be formed to a link with MTU of 1200 bytes what is the offset value, MF value, total length of the last fragment.
- MF = 1, Total length = 1200, offset = 735
 - MF = 0, Total length = 1196, offset = 735
 - MF = 0, Total length = 1120, offset = 735
 - MF = 0, Total length = 1120, offset = 5880

[MCQ]

2. Host A send a TCP packet containing 8880 bytes of user data to Host – B over an ethernet LAN. Ethernet LAN frames may carry data upto 1500 bytes (i.e. MTU = 1500 Bytes) size of TCP Header is 40 bytes and size of IP Header is 20 bytes. How many total numbers of Fragment will be transmitted, what is offset value of last fragment and what is the total length of last fragment.
- 6, 925, 40
 - 7, 1110, 60
 - 7, 1110, 40
 - 6, 1110, 1480

[NAT]

3. An IPV4 datagram, the M bit is 0, the value of HLEN is 15, the value of total length is 600 and fragment offset value is 400.
If the sequence number of first byte of this datagram is 'a' and last byte is 'b' then what will be the value of 'a + b' ?

[NAT]

4. Suppose a TCP message that contains 2048 bytes of user data and 20 bytes of TCP header is passed to IP for delivery across two networks of the internet. The first network uses MTU 1024 bytes and second network uses MTU 512 bytes. Each network MTU gives the size of largest IP datagram that can be carried in a link larger frame. Assume all IP headers are 20 bytes. Calculate total number of fragments that are received by destination.

[NAT]

5. An IP datagram of size 2000 bytes arrives at a router, the router has forwarded this packet on a link with MTU size 512 bytes. The IP header is of 20 bytes. What will be the fragment offset value of the fourth fragment.

Q.5 to 10 Carry TWO Mark Each

[MSQ]

6. Which of the following option is true regarding option field in IPv4?
- If the header length is greater than 5 ($HLEN \geq 5$) it means that the options field is present and must be considered.
 - Copied, option class, and option number are sometimes referred to as single eight bit field, the option field.
 - The value of "Type" in the security option field of an IPv4 header is 131.
 - None of the above.

[NAT]

7. In an IP packet, the IP header has value of TTL field as 10110101 in binary then calculate the number of hops this packet can travel.

[MSQ]

8. An IP packet has arrived with first 8 bits as 01000011 which of the following options are false?
- The total number of bytes in header is 20 bytes.
 - The number of hops this packet will travel is 2.
 - The receiver will reject the packet.

- (d) The total number of bytes in header is 8 bytes

[MSQ]

9. Which of the following fields in IPv4 datagram is/are related to fragmentation?

- (a) Identification
- (b) flag
- (c) Type of services
- (d) Fragment offset.

[MCQ]

10. Which of the following is correct option about the IPv4 fields?

- (a) In IPv4 header the fragment offset field is of 16 bits.
- (b) In IPv4 header the fragment offset field is of 13 bits.
- (c) In IPv4 the protocol field is of 16 bits.
- (d) None of the above.

Answer Key

- | | |
|-----------------|-----------------|
| 1. (c) | 7. (181 to 181) |
| 2. (b) | 8. (a, b, d) |
| 3. (6939) | 9. (a, b, d) |
| 4. (7 to 7) | 10. (b) |
| 5. (183 to 183) | |
| 6. (c) | |

Hints and Solutions

1. (c)

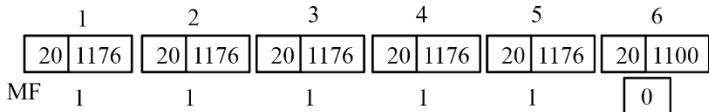
MTU

20	1180
----	------

20	6980
----	------

 datagram

$$\begin{aligned}\text{Number of fragment} &= \left\lceil \frac{6980}{1180} \right\rceil \\ &= \lceil 5.91 \rceil \\ &= 6\end{aligned}$$



Offset 0 – 146 147 – 293 294 – 440 441 – 587 588 – 734 735 – 872

$\frac{1176}{8} = 147$

Last fragment

20	1100
----	------

MF = 0

Off Set = 735

Total length = 20 + 1100

Total length = 1120

2. (b)

TCP packet user data = 8880 bytes

TCP header = 40 bytes

IP header = 20 bytes

NH	TH	Data
----	----	------

20	40	8880
----	----	------

↓

IP packet payload

MTU = 1500 byte

20	1480
----	------

$$\text{Number of fragments} = \left\lceil \frac{40 + 8880}{1480} \right\rceil$$

$$\begin{aligned}&= \left\lceil \frac{8920}{1480} \right\rceil \\ &= \lceil 6.02 \rceil = 7\end{aligned}$$

20	1480
----	------

20	1480
----	------

20	1480
----	------

20	1480
----	------

20	1480
----	------

20	1480
----	------

20	40
----	----

Last fragment →

20	40
----	----

Total length = 20 + 40 = 60

$$\begin{aligned}\text{Offset} &= \frac{6 \times 1480}{8} \\ &= \frac{8880}{8} \\ &= 1110\end{aligned}$$

3. (6939)

Range 6938 – 6940

M = 0 means it is the last fragment

HLEN = 15

Header size = 15 × 4

= 60 bytes

60	540
----	-----

Offset value = 400

Address of first byte = 400 × 8 = 3200

Address of last byte = 3200 + 539 = 3739

a + b = 3200 + 3739

= 6939

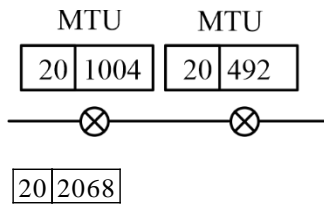
4. (7 to 7)

TCP message user data = 2048

TCP header = 20 bytes

IP packet payload = 2048 + 20

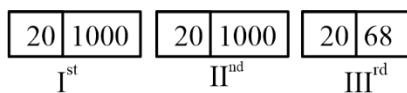
= 2068 bytes



IP datagram

$$\begin{aligned} \text{Number of fragments in first network} &= \left\lceil \frac{2068}{1004} \right\rceil \\ &= \lceil 2.05 \rceil = 3 \end{aligned}$$

After first network:



In second Network:

$$\begin{aligned} \text{Number of fragment of I}^{\text{st}} \text{ fragment} &= \left\lceil \frac{1000}{492} \right\rceil \\ &= \lceil 2.03 \rceil \\ &= 3 \end{aligned}$$

$$\begin{aligned} \text{Number of fragment of II}^{\text{nd}} \text{ fragment} &= \left\lceil \frac{1000}{492} \right\rceil \\ &= \lceil 2.03 \rceil \\ &= 3 \end{aligned}$$

$$\text{Number of fragment of III}^{\text{rd}} \text{ fragment} = 1$$

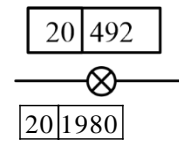
$$\begin{aligned} \text{Total number of fragment} &= 3 + 3 + 1 \\ &= 7 \end{aligned}$$

5. (183 to 183)

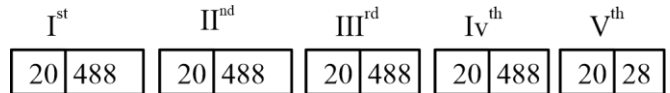
IP datagram = 2000 bytes

IP header = 20 bytes

MTU



$$\text{Number of fragment} = \left\lceil \frac{1480}{492} \right\rceil = \lceil 4.02 \rceil = 5$$



$$\begin{aligned} \text{Fragment offset value of fourth fragment} &= \frac{3 \times 488}{8} \\ &= 183 \end{aligned}$$

6. (c)

Option C is false, since the value of 'Type' in the security option field of an IP header is 130.

7. (181 to 181)

$$(10110101)_2 = (181)_{10}$$

Total number of hops = 181

8. (a, b, d)

0100

↓

IP version

$$(0100)_2 = 4 \text{ (IPv4)}$$

$$(0011)_2 = 3 \times 4 = 12 \text{ bytes}$$

Header should be between 20 – 60 bytes. Hence, the receiver will reject the packet.

0011

↓

HLEN

9. (a, b, d)

flag, identification, and fragment offset fields are related to fragmentation.

10. (b)

Fragment offset = 13 bits

Protocol field = 8 bits.



For more questions, kindly visit the library section: Link for web: <https://smart.link/sdfez8ejd80if>



PW Mobile APP: <https://smart.link/7wwosivoicgd4>