IPv4 — 1980s Add. concept

Internet protocol version 4 (1983)

▷ The IPv4 address is 32-bit number that uniquely identifies a network interface on a Machine
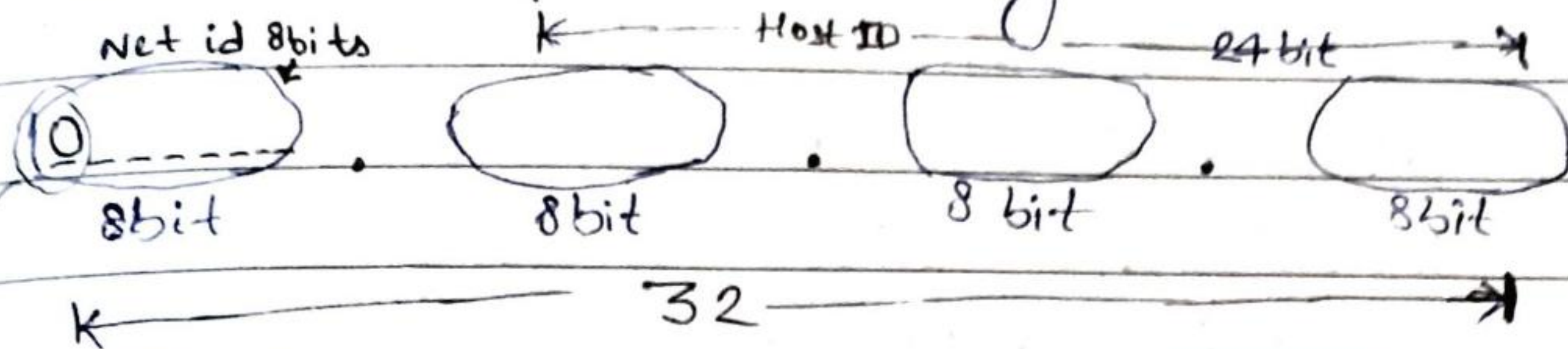
* **Classful addressing :—**

▷ class 'A'	0 – 127	128	
▷ class 'B'	128 – 191	64	
◁ class 'C'	192 – 223	32	2
▲ class 'D'	224 – 239	16	2^4
▷ class 'E'	240 – 255	16	2^4

▷ **classes and blocks :—**

class A	Network ID	Host ID	Host "	Host "		
	8	8	8	8	▭	2^{24} – user possible

class B	N	N	H	H		
	8	8	8	8	▭	2^{16} "

class C	N	N	N	H		
				8	▭	2^8 "

CLASS A

class 'A' in Ip^{v4} Addressing

Net id 8bits ←— Host ID —→ 24 bit

⓪ . ◯ . ◯ . ◯

8bit   8bit   8 bit   8bit

←———————— 32 ————————→

this bit is fixed as '0' to identify class.

* No. of Total IP Add. in class 'A' is 2^{31}.

• No. of Networks in class 'A' $= 2^7$ (128) -2

$$= \boxed{126}$$

→ first '00000000' ~~to~~ of '01111111' (0 ⊕ 127) doesn't assigned for any organization. So

\# IANA holds there (0 ⊕ 127) for 'loopback' or 'Diagno'- purpose

↦ Total No. of Host possible in class 'A' is $(2^{24} - 2)$

$$=$$

* Because first and last is reserved as a
  → Broad cast with last add (127) • f first for 'own' identificat.

eg:- 64.0.0.0 ®   ▷ 64.255.255.255 if class 'A's last three octat is 111 (All 1) it is Known for "Broad cast"
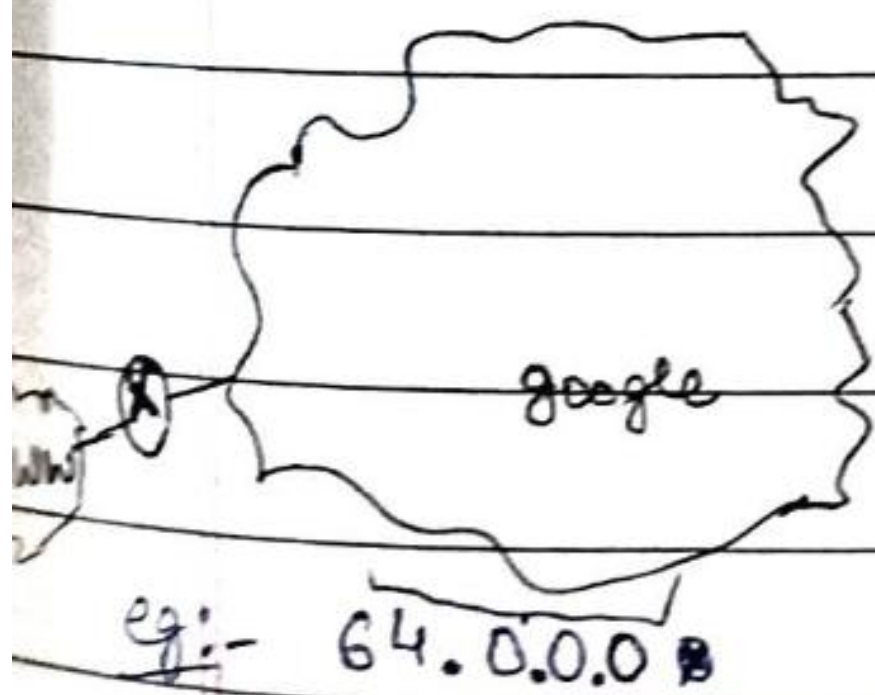
③ **Default Mask of class 'A'** = 255.0.0.0 it used to get class belongs to.

eg] IP:- 64.00.6

Binary:- 01000000.0.0.00000110
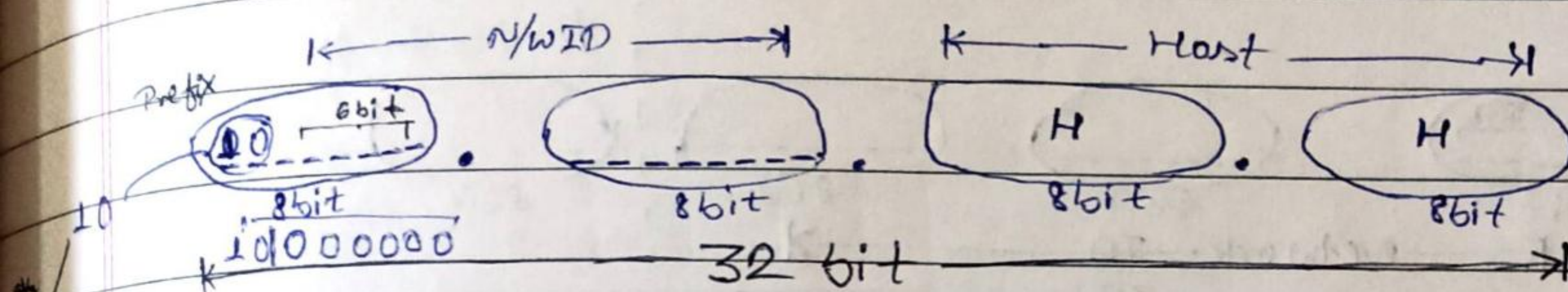
Mask:- 11111111.0.0.00000000 } 'AND' op.

01000000.0.0.0000000

(Total: 65536) **CLASS - B** (128 - 191)

* class 'B' in IPv4

Prefix
|← — N/W ID — →| |← — Host — →|

(1 0 [8 bit]) . (-----) . (H) . (H)

10   8 bit   8 bit   8 bit   8 bit

10000000

|← ——————— 32 bit ——————— →|

* fixed to identify class.

▷ Range :- 128 - 191.   ▷ No. of Network :- 2^{14} (6+8)

▷ No. of addresses = 2^{30}. (1 Billion).   = (16384)

* No. of Hosts possible in each Network :- $(2^{16} - 2)$ = (65536)

→ (65534) useful

Eg :-   128. 0. 0.0 (0.0) These bits are denotes itself;

128. 0. 0. 255.255 :- Reserved for 'Broad cast Purpose'

→ Default Mask in 'B' — 255: 255. 0.0

in Binary :- 11111111 . 11111111 . 00000000 . 00000000

Ex To get Network iD = Default Mask (AND) Give Address:-

      130. 2. 4. 5
'AND' 255. 255. 0. 0
      130. 2. 0 0 :- Network ID

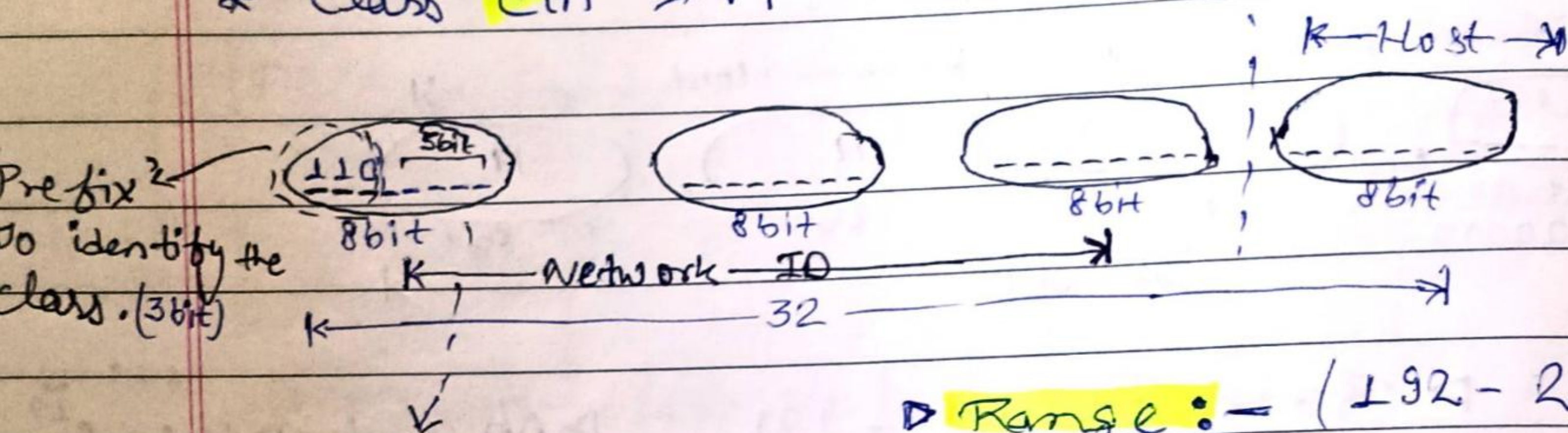** Maximum length (In.Bytes) OF IPV4 Data gram :- 65535.

CLASS-C   (192-223) 32

* class 'c' in IPv4

K— Host —»

Prefix²
To identify the
class. (3bit)

110   5bit
8bit
K—— Network—IO
K———————— 32 ————————»

92 ▷
```
11000000
11000001
11000010
     ⋮
11011111
```
223

▷ Range :- (192 - 223)

* No. of Networks :- 2^{21} (20,97152) :- 5+8+8 bit=

▷ No. of IP Addresses in class 'c' = 2^{29}
= (12.5%)

* No. of Possible host = (Total - 2) :- (256-2)
= (254)

⇒ ⑧ Default Mask :- 255. 255. 255. 0
in 'c'
= 11111111. 11111111. 11111111. 0

Eg:- Add. = 195. 2. 3. 8
'AND' 255. 255. 255. 0
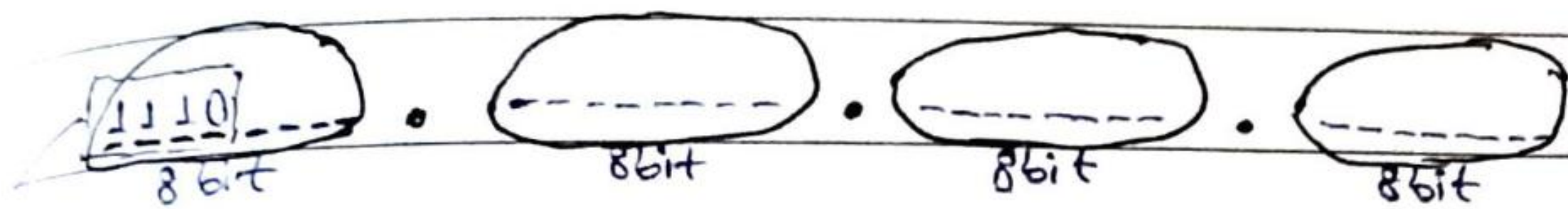195. 2. 3. 0 is [Network ID]

ABC
in class
'c'
{ 195. 2. 3. 0 ▷ "Identification ID of ABC."
{ 195. 2. 3. 255 ▷ "Broadcast of ABC"

CLASS-E $\underset{\times}{/}$ D $\underbrace{(224-239)}$

(240-255)

* class 'D' in IPV4

|1110|⌣⌣. ⌣⌣. ⌣⌣. ⌣⌣
8 bit   8bit   8bit   8bit

|← ———— 32 ————→| * class 'E' in I

This 1 bit : 11100000
next bit : 11100001
     : 11100 010
the class 'D'
|11101111|

No. of IP addresses possible in 'D'
$$= 2^{32} - 2^4 = \boxed{2^{28}}$$

▷ 'D' is reserved for Multicasting, group Email/Broadcast

→ class 'E' in IP :— |1111|. ⌣⌣. ⌣⌣. ⌣⌣
                        8bit   8bit   8bit   8bit

This 4 bit |← ———— 32 bits ————→|
(1.111) represent
the class 'E'.
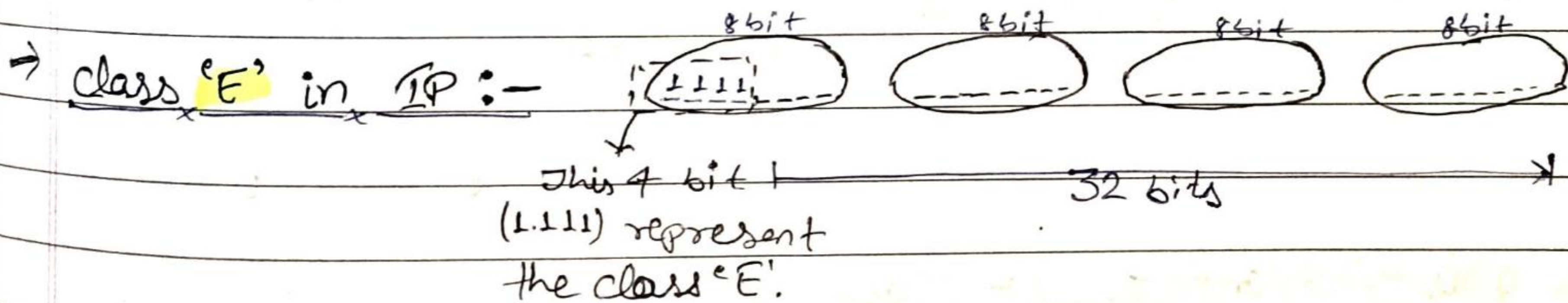
* No. of IP addresses possible in 'E' $= 2^{28} =$ (

*# Reserved for Military purpose

GATE/UGC questions.

IPV4 Classful.

Q) 1). IP Address 201.20.30.40

* calculate network ID :- get 201.20.30.0 As
* " 4th Host ID :- 201.20.30.4 is in 4th place
* " Last Host ID :- 201.20.30.254 (because last is not for Host
* " Broadcast ID :- 201.20.30.255.

1st step Identify class :- [201].20.30.40

Class - C

2nd :- Betal Default mask is :- 255.255.255.0

Then 'AND' Operation b/w IP & Default Mask

$$201.20.30.40$$
$$AND \ \underline{255.255.255.0}$$
$$201.20.30.0 \nearrow Net. ID$$

* **Two types Broadcast :-** → **Limited :-** 255.255.255.255 (It always same)
  → **Direct :-** 201.20.30.255 (According to this que)

* **Dis-Advantage of Classful :-** • Wastage of IP address.
  • Maintenance is time consuming
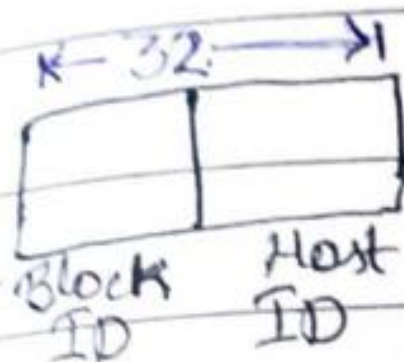 • More Prone to errors   * Security.

Note|| • This is why classless Addressing introduced to minimize the wastage of IPs.

CLASSLess (1993)   CIDR
Addressing in IPv4

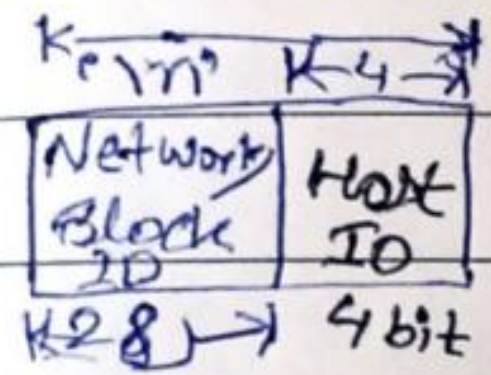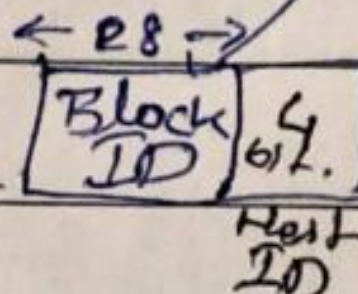▷ No classes is here.

    ▷ only blocks According to demand.

|←— 32 —→|

Block ID	Host ID

Network ID but Not fixed

* Notation :- x, y, z, w / m.

    eg. 200. 10. 20. 40/(28)

↳ mask no. of bits represent block / network

⊙→ Host ID = $\boxed{\text{Total} - m}$

$32 - 28 = 4 bit$

←— 'm' —→	←— 4 —→
Network Block ID	Host ID

|← 28 →|← 4 →|
Block ID 6/7. ← 28 →
Host ID

$= 2^4 = \boxed{\text{Host ID}}$

←28→ → 4bit

* Here, Default Mask depends on $\boxed{m}$ value above is /28 So :-

(28 times) '1' - 11111111. 11111111. 11111111. 1111000

Mask = 255 . 255 . 255 . 240.

To check given IP address's Network ID. ⇓

① way :- given 200. 10. 20. 00101000 :- Open only Last Decimal.

    |←— 28 —→|

Last Part   Step2: changes '0000'

    00010000 convert in Decimal.

Network ID is :- 200

Of above eg. $\boxed{200. 10. 20. 32}$

Rules :- 1. Address should
    be contiguous.

2. No. of address in a block must be in power of 2.

3. First address of every block must be evenly divisible with size of blocks.

② way :- first write down
    Default Mask :-
    (above) 255.255.255.240

Then Do (AND) operation with given / question IP address

So,   255. 255. 255. 240
'AND'   200. 10 . 20 . 40

(Ans) = 255. 10 . 20. 32