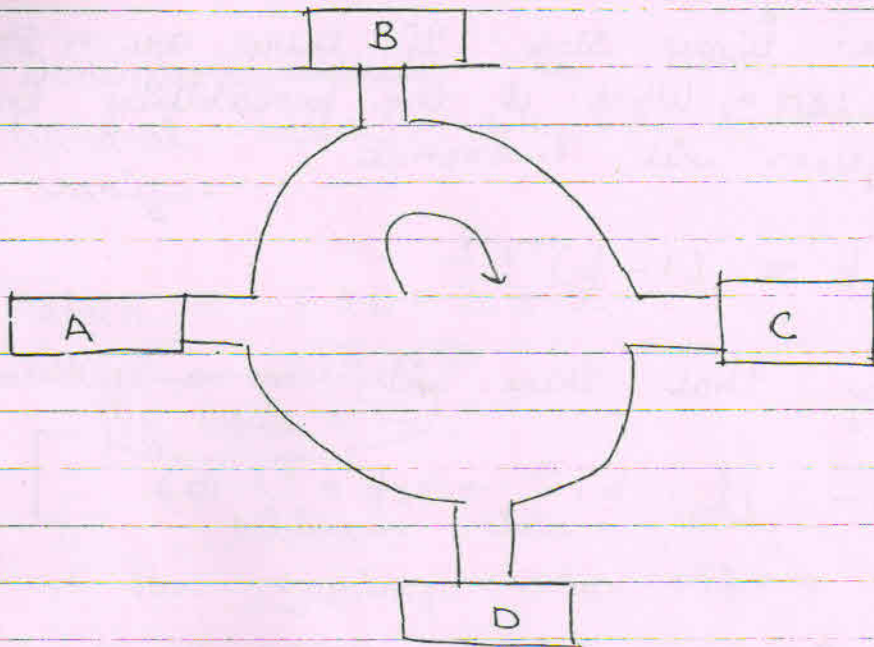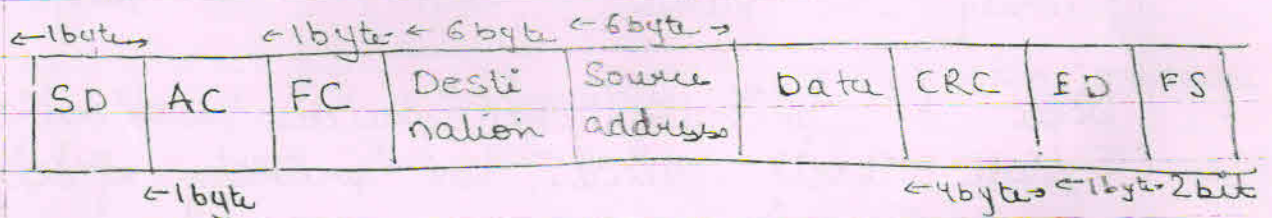i.e It is colloision free protocol.

#→

- Suppose A k pass token hai, A ko frame send karne hai C ko then A ne B ko send ki Since B is not distination Jon firstly B, frame ko regenurate karega then channel par rakhega then frame C k pass gaya C ka distination address match hogaya toh woh frame ko rakhega aur acknowledgement Origonal frame k saath append karke send kardega.

- D k pass jayegi then A k pass jayegi.

- Agar A k pass ack aaya toh regenurate the token and deleting that frame from the ring.

- Frame ko delete karni ki responsibility sender ki hoti hai.

- Jaisehi frame destination k pass jayegy frame k saath acknowledgement attach kar k send kar dega sender.

- Token holding time par restriction hota hai token ring protocol mein-

- In 802.5 LAN Standard → 10ms is the maximum token time for any system.

Format of Token Ring frame:-

←1byte→		←1byte→	← 6byte →	← 6byte →				
SD	AC	FC	Desti nation	Source address	Data	CRC	ED	FS

←1byte   ←4bytes→ ←1byte-2bit

- Start Delimeter :-
Yaha kohi preamble nahi hota hai kyo nahi hota hai woh isliye nahi hota hai, kyoki yaha par system kuch na kuch read karta rahata hai.

ACCESS CONTROL:-
Size of Access control field is 1 byte.

priority   Reservation   Monitor   Token bit

- In Ethernet there is no concept of priority but in token ring there is ano priority concept.

- Since priority bit is 3bit long so upto 0 to 7 tak priority field ki value ho Sakta hai

  0 represent lower priority

  1 - represent higher priority

- Priority bit shows priority of data the current frame hold, Agar current frame priority 5 ka data hold kar raha hai.toh priority ki value 5 hogi.

- Data ki priority kon decide karta hai??

Ans→ System itself decide the priority of data

- Suppose A is Sender awr A ne aapne data ki priority kitane kar rakhi hai 5, A se frame B k pass gayi, B k pass data hai transmit karne ko uske pass data hai with priority greater than or equal to current priority tabhi B reservation bit ko set karsakta hai, otherwise reservation bit mein kohi change nahi hoga. Due to which Starvation occur, jaha priority ka concept aaya, waha algorithm starvation se suffer hoti hai.

- Monitor bit :→

→ Size of Monitor bit is 1 bit.

- Sender is responsible for removing the frame from the token ring.

- Aaise frame jiska sender crash ho gaya ho after transmission such frame are known as Orphan frame.

- Token ring mein joh bhi problem aayegy usko resolve karne ki responsibility ek special system ki hoti hai that system is known as Monitor.

- Monitor is responsible for removing orphan frame from the ring.

Ques: Kya monitor kohi server hota hai kya??
Ans. Nahi, kohi bhi system joh ring mein present hai woh monitor ban sakta hai

- Generally woh joh ring mein sabse phale aata hai, attach hota hai woh monitor bit kahalata hai.

- Monitor bit ki help se hum pata karta hai ki given frame orphan frame hai ki nahi.

- Suppose A ne frame send ki toh A ne aapne frame ki monitor bit 0 karke send ki ; Suppose C is monitor, monitor kya karega, woh expect karta hai ke incoming frame ki monitor bit should be 0 aur monitor bit usko one set kar dega.

Case I :- When Sender crash hogaya

- Suppose A ne frame send ki aur crash hogaya

- A system ne joh frame send ki hai uske monitor bit ko 0 karke send karega.

- C k pass aaya usne monitor bit ko one set karke send karega.

- Since sender toh crash hogaya toh frame ko ring se bahar inkalne ki responsibility monitor ki hogi.

- Since C is the monitor to frame again traverse hoke C k pass aayegey usne dekha monitor bit toh one hai toh monitor ek control frame generate generate karega us se pata chalega ki sender hai ki nahi.

- Agar sender hai aur monitor bit one hai toh monitor samajyega ki corruption k karan monitor bit 1 hue hai, toh woh usse orphan bit ki tarah treat nahi karega. Now sender

such mein crash hogaya toh second time frame traverse ho k monitor k pass aayi toh monitor use orphan frame ki tarah treat karega, monitor us frame ko yaha se hatayega means ring se hatayega.

Case 2: Jab Monitor Crash hogaya.

• Suppose A is Sender it sets monitor bit to 0 then frame wapas A k pass aagayi ring me traverse hoke.

• Now A also check for monitor bit if monitor bit is 0 then it generate a control frame which check whether monitor bit exist a not if monitor bit does not exist then A configure itself as a monitor.

Case 3: → Both Sender & monitor crash hogaya ho.

→ Suppose A is Sender usne monitor bit ko 0 set ki, aur monitor hi crash hogaya plus Sender bhi crash hogaya. after transmission Now A se joh frame send ki usko kon ring se bahar karega ???

Ans→ Token ring mein har system are aware of how many system are there in the token ring.

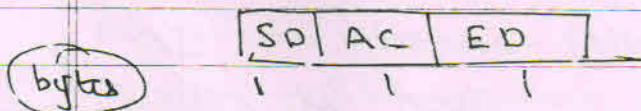• Har system kuch na kuch calculation karta rahta

hai ki agar A k pass token abhi hai toh next time A k pass token kab aayega.

Har system timer set karke rahata hai, jiska timer sabse pahale set hua hai woh ek control frame generate karta hai to check whether monitor bit is exist or not agar karta hai toh regenerate the frame aur agar nahi toh woh us frame to bahar nikalega ring se aur woh khud ko monitor bana lega.

Token bit :→

When token bit is equal to 1 toh token hai aur agar token bit 0 hai toh control frame or data frame hai.

⤷ Token is also a frame with 3 bytes.

SD	AC	ED
1	1	1

(bytes)

FC (Frame Control) :→

→ Different value of FC represent different control frame

$$FC = 0 \rightarrow Data\ frame$$
$$FC \neq 0 \rightarrow Control\ frame.$$

FS (frame status):

↳ 2 bit field

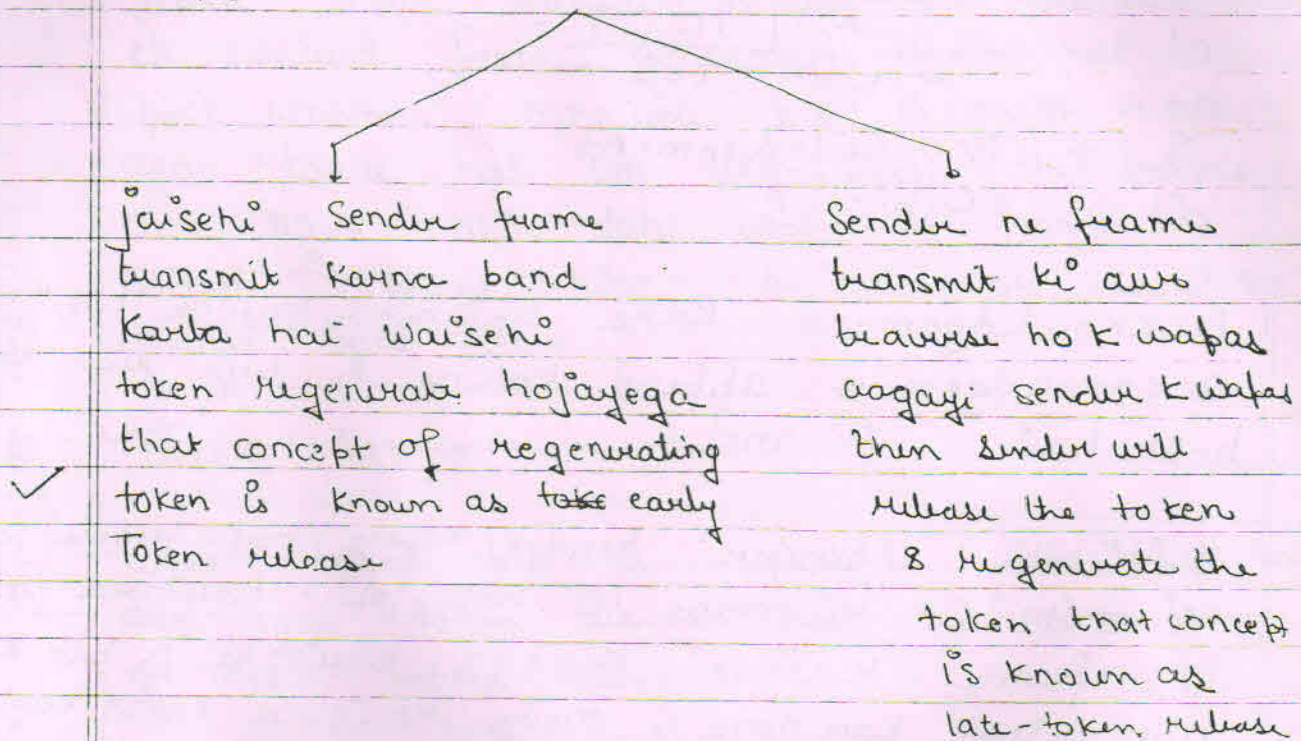| A	C
←1 bit→	←1 bit→

A → Acknowledgement
C → Copied.

- Acknowledgement kaha append karta hai, acknowledgement append karne k liye two bits hoti hai A and C

- Initially sender send karta hai frame jab A and C ki value 0 hoti hai. Reciever jaise hi frame recieve karega waisehi A bit ko one send kar dega, mein reciever exist karta hai agar reciever ne aapne pass rak li hai frame toh woh C ko 1 set kardega.

- Agar C bit 0 hai iska mailab hai may possible there is some error in frame. May possible ki reciever k pass buffer is not available.

A	C	
0	0	
1	1	
1	0	
0	1	x (Not possible).

Efficiency of Token Ring

- Token regenerate karne k two ways hote hai

Jaisehi Sender frame transmit karna band Karta hai waisehi token regenerate hojayega that concept of regenerating token is known as ~~take~~ early Token release

Sender ne frame transmit ki aur traverse ho k wapas aagayi sender k wapas then sender will release the token & regenerate the token that concept is known as late-token release

Efficiency of Token Ring :-

Case I : When all system wants to transmit
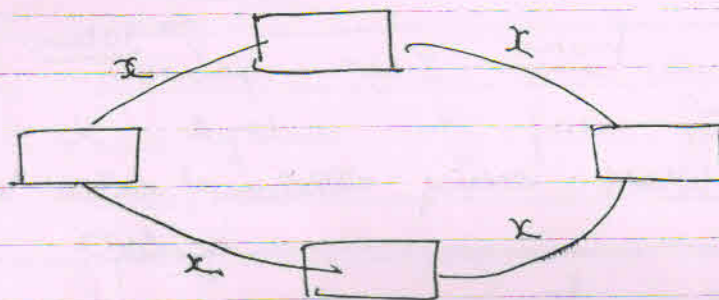
Case II : When only one system wants to transmit

Kuch termology :-

i) Ek bit ko pure ring mein ~~a~~ traverse karne wala time (Ring latency) kahalata hai.

So Ring latency = $t_p + (N \times \text{bit delay})$

- Single bit ko sender se sender tak jana mein time te. kitana time lagta hai usse tp kaha jata hai token ring mein.

- Token ring mein aaisa mana jata hai ki har system equidistance par hota hai.

- 100 ms mein frame A se A par aajati hai loh A se B par jane mein 25 ms lagegy i.e $tp/4$

- Now Efficiency of early token Release:-

Case 1:- When only one System want to transmit

$$\eta = \frac{t_x}{t_x + t_{xA} + t_p}$$

transn time for frame

→ Total token ko wapas A k pass aana ka time.

Case 2:→ When all (Every) Station wants to transmit

$$\eta = \frac{t_x}{\boxed{t_x} + \boxed{t_{xA} + t_p/N}} \quad \text{—token}$$

hai...