SMCN

1. Multiple Access schemes for Mobile/data communication in space.

(i) The service provider (SP) for a Mobile service:
- voice
- wireless cellular telephone
- data
- digital TV transmission

(ii) SP gets a piece of Bandwidth (BWt) on lease from government

$BWt = f_H - f_L$

(iii) There are N number of users $N >> 1$
- Mobile phones: 2G/3G/4G
  - 4G onwards smart phones.
- Laptops
- Desktops

(iv) If more than one user simultaneously try to send their signal over space using the same Bandwidth BWt, then there shall be interference in the sky

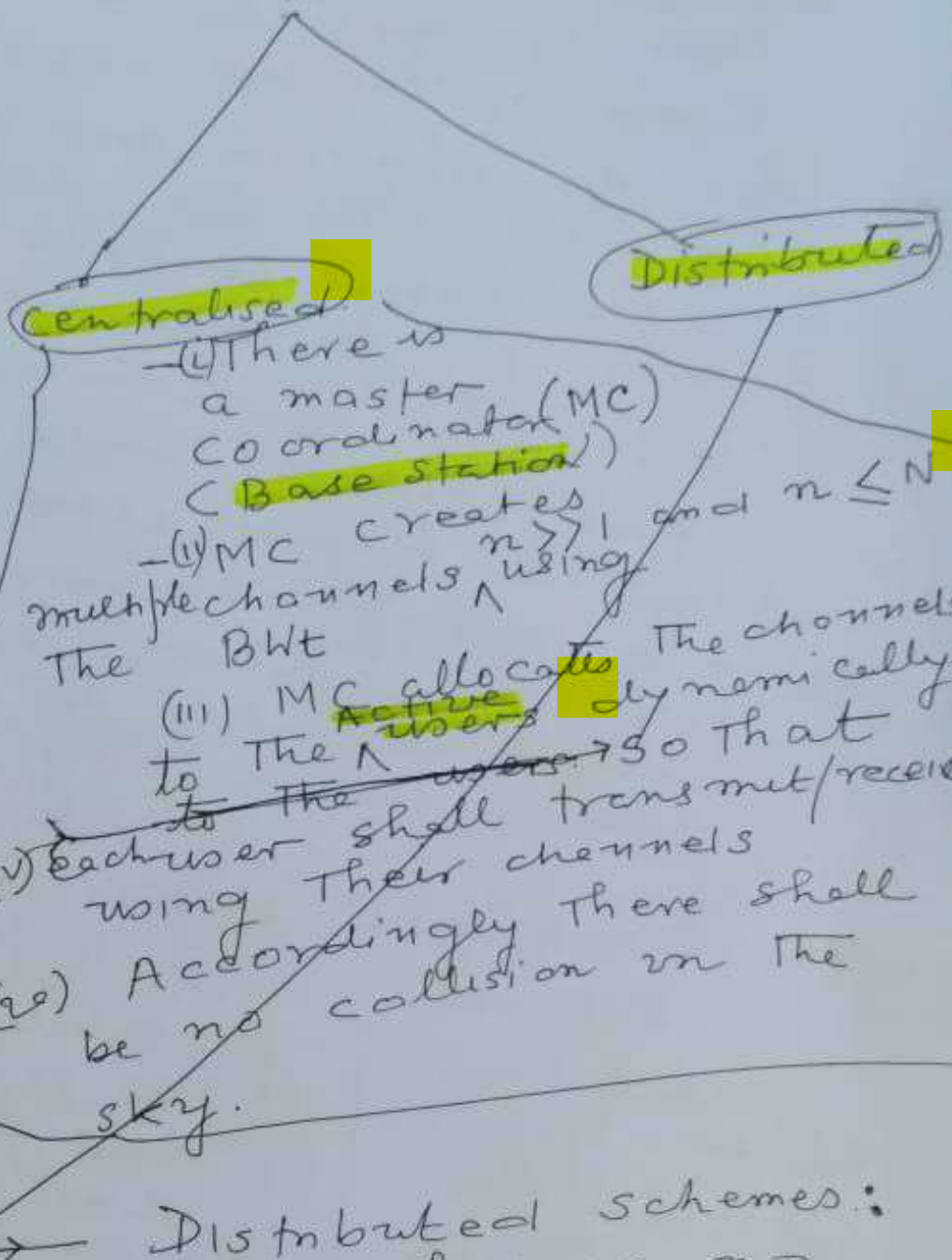
(20) Such more than one user signal (data/voice ...) transmission in the sky is known as collision in the sky, where mixture of multiple source signal shall produce junk

(202) Due to above collision original data/voice can not be recovered.

(2022) The Multiple Access schemes (MAS) are different modalities of transmissions in the sky, using a particular mechanism/ algorithm so as to enforce:

- There is no or minimum collision in the sky
- Even if the collision takes place MAS should be able to recover from collision.

(2) MAS



Centralised
- (i) There is a master coordinator (MC) (Base station)
- (ii) MC creates multiple channels using The BWt $n \gg 1$ and $n \leq N$
- (iii) MC allocates The channels to The ~~Active users~~ dynamically.
- (iv) ~~to The users~~ So That each user shall transmit/receive using Their channels
- (v) Accordingly There shall be no collision in The sky.

Distributed schemes:
- (i) There is no ~~Master~~ cordinator (MC) / both same Point co-ordinator (PC)
- (ii) No individual channels are created.

Distributed schemes:

(iii) Each users shall contend among them to get the whole Bandwidth (BWt) according to An algorithm and transmit / receive using the whole BWt

(1st) The Above Algorithm can only try to minimise collision

(2) - In case of collision, the above algorithm should be able to detect collision.

- In case of occurance of collision above algo should be able to recover from collision.

(04) Centralised schemes Vs Distributed schemes

Centralised	Distributed
(i) NO MC/PC	(i) NO MC/PC.
(ii) Used for Mobile Data / Voice communication — 2G — 3G — 4G — 5G	(ii) Used for WLAN (Wifi) for Mainly data communication

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MAS (Multiple Access schemes)

- Centralised
  - (i) Freq Division Multiple Access (FDMA)
    - (A) FDMA
      - FDD (Frequency Division Duplexing)
        - 1G voice
        - Terminal Product
        - ∧ AMPS
        - Analog transmission
    - (X)
  - Time Division Multiple Access (TDMA) (B)
    - TDMA / FDD
    - TDMA / TDD (Time Division Duplexing)
      - 2G voice/data communication.
      - Voice - GSM
      - Data - GPRS/EDGE (India/Europe)
  - Code Division Multiple Access (CDMA)
    - (C) CDMA/FDD TDD
      - (i) 3G/4G/5G voice data
      - (ii) Digital System
- Distributed
  - (D) CSMA/CA (Carrier Sense Multiple Access)
    - WLAN (wifi)

(A) FDMA/FDD

(i) UL = BWt/2 BWt DL

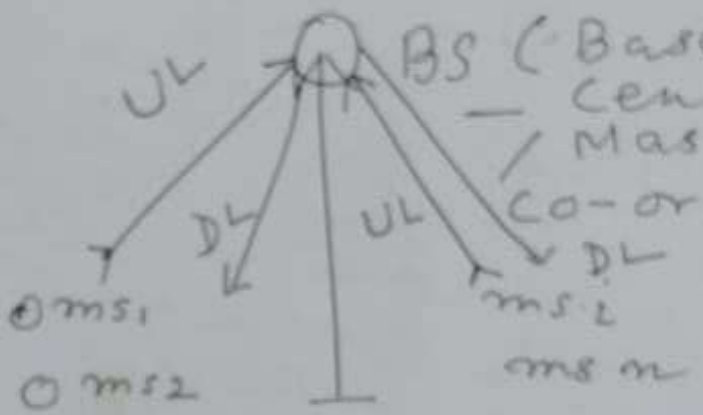
f_L f_H

DL = Down link

UL = uplink

$= \frac{BWt}{2} = DL = \frac{BWt}{2}$

(ii)



(a) UL ⇒ uplink Frequency used for communication (SIMPLEX) from Mobile phones to Base stations

(b) DL ⇒ Downlink link Frequency SIMPLEX used for communication from BS to mobiles

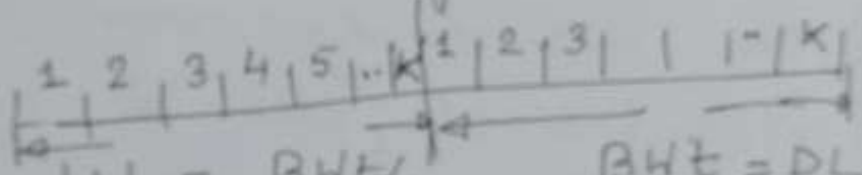
(c) using UL and DL simultaneously for full duplex communication (FDD) is created

(d) Since UL and DL is — by dividing BW (BWt) it is —

(d) cond
it is known as Frequency Division Duplexing (FDD)

(e) UL ⇒ - Lower Frequency Band of BWt
- As radiation LOSS Less
DL ⇒ Upper Fequary Band of BWt

(iii) Uplink / Downlink channel creation by Base station



UL = BWt/2 BWt/2 = DL

(iv) (a) UL is divided into K no of Frequency slots 1 to K

(b) Each of 1 to K is known as uplink voice channel

(c) Width of each voice channel = UL/K Including guard band between channels

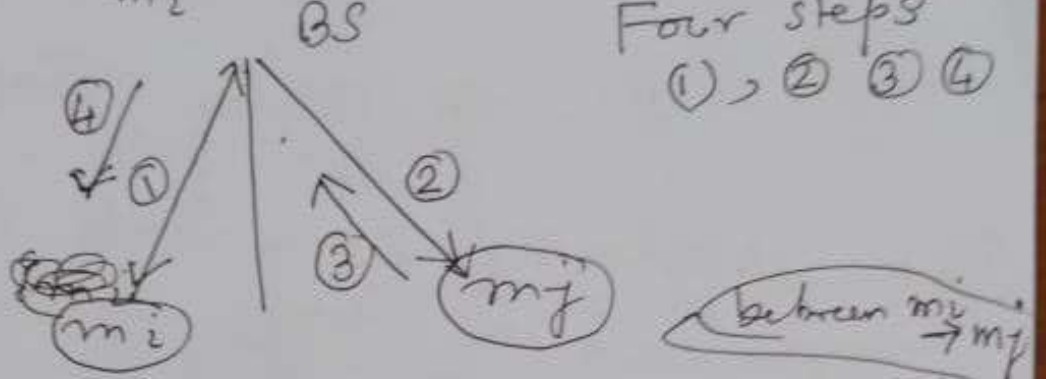
(a) DL is divided Downlink channels

(b)

(c) — all above same as left side but for down link channels

(d) So K no of uplinks channels and k number of downlink channel are under Base station

(e) ~~for~~ ~~mi~~ to ~~mj~~ Mobile communicate



(f) For full duplex voice communication

(a) m_i mobile allocated by Base station one uplink channel

- $1 \le$ cui $\le K$
- one downlink channel $1 \le cdi \le K$
- cui for transmitting from mobile(i) to Base stn
- cdi for ~~transmitting~~ receiving from Base stn to mobile mi

(b) Same for mj cuj & cdj

(g) voice communication under a base station is Semiduplex

Load from (g) (a)

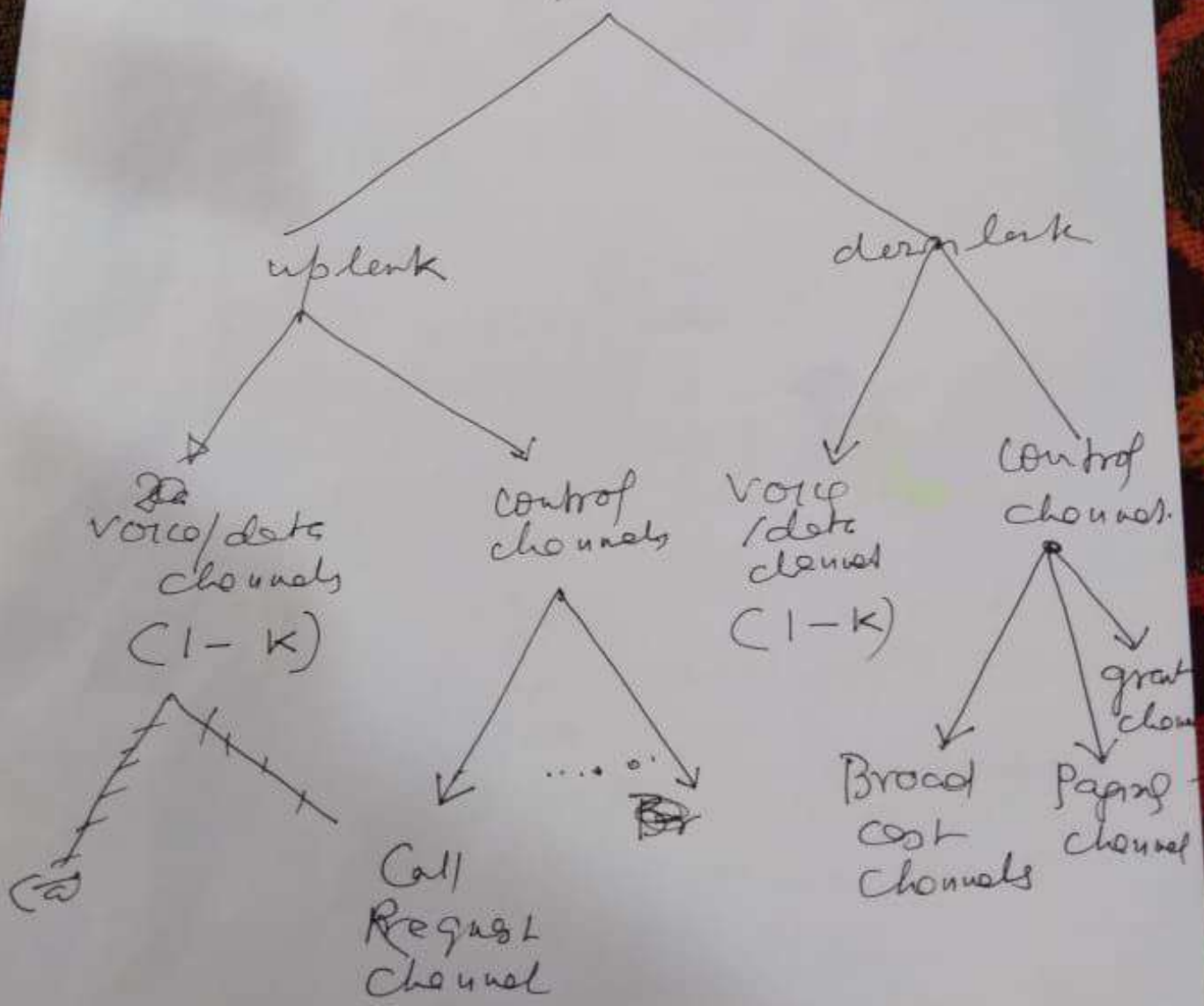
so mi & my can use same only one uplink channel cu for transmitting and cd for receiving

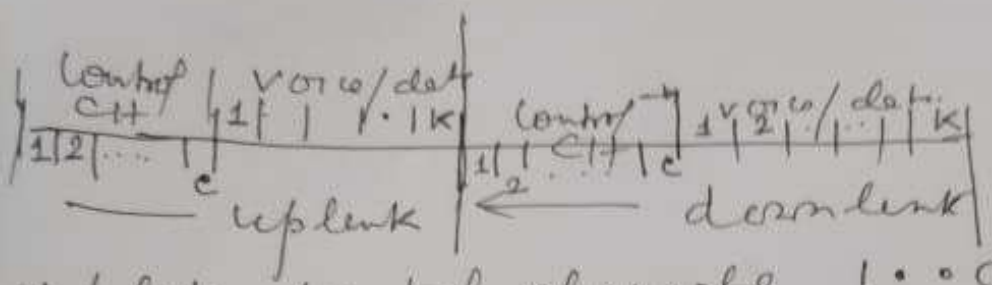
(h) ~~for~~ Data is full, duplex so channel allocation as like (f)

(10)

1. Dynamic channel Allocation

Control channels are required.





(2) (a) uplink control channels 1..C
(b) uplink voice/data " 1..K
(c) downlink control channel 1..C
(d) downlink voice/data " 1..K

(3) (a) Frequency width of control channel << Frequency width of voice/data.

(b) control channels are also known as mini channels.

(4) (a) Uplink (i) Some of the control channels (Base stn.) are Request channels. — Particular Mobile to
(ii) Rest shall be taught letter on.

(b) Downlink (i) Some Broad cast CH
(ii) Some are paging channels
(iii) Some are grant channels.
(iv) All downlink control channels are broad cast channel from Base stn ⟹ mobile station for receiving