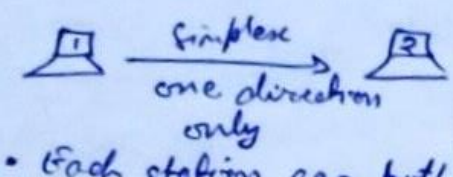
Simplex = The communication is unidirectional, as a one way street. one device always sends can always send other can always receive. Eg- Radio, mouse

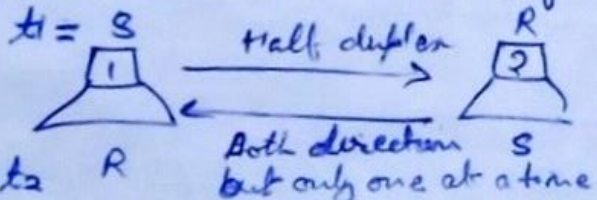
- The simplex mode can use the entire capacity of the channel to send data in one direction.



Radio
Walkie-talkie → Listeners

Half duplex = • Each station can both transmit and receive, but not at the same time. Eg- like a one lane road, walkie-talkie

- when one device is sending, the other can only receive and vice versa.
- In a half duplex transmission, the entire capacity of a channel is taken over by whichever of the two devices is transmitting at the time
- Walkie-talkie are both half duplex systems.



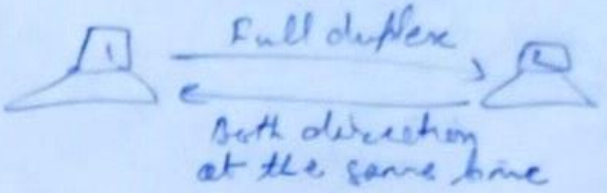
use army walkie-talkie

Road in hill station

Full Duplex = • Both station can transmit and receive at the same time. Actually it is two half duplex connections.

- Telephone network is an example of full duplex mode, when two people are communicating by a telephone line, both can talk and listen at the same time.

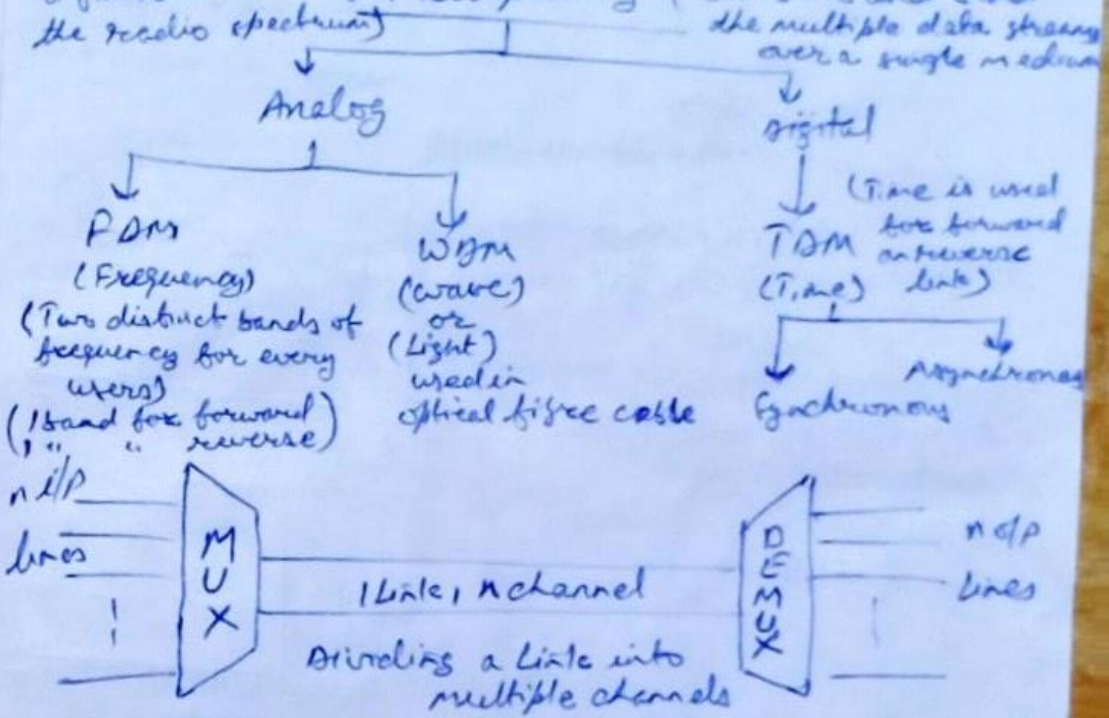
- The capacity of the channel, must be divided b/w the two direction.



Highways, Divay Roads

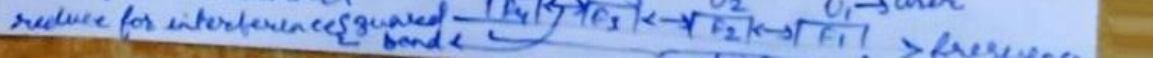
(used to allow many mobile users to share simultaneously a finite amount of the radio spectrum)

Multiplexing (combine and send the multiple data streams over a single medium



FDMA - • Assign individual channel to individual user and different users are assigned different traffic channels.

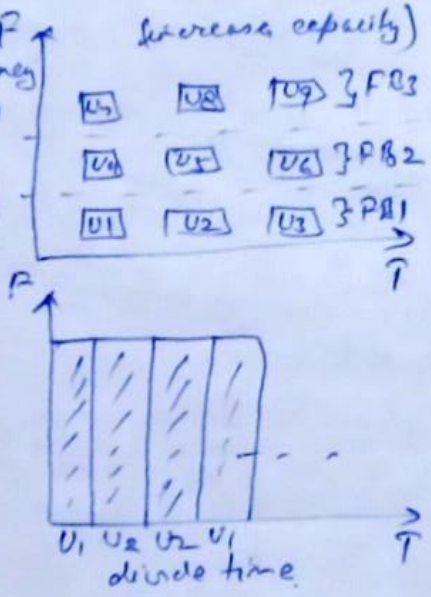
- Each user is allocated unique frequency.
- During call period, no other user can share same channel



Features
- carries only one phone circuit at a time
- If a channel is not used, then idle. (wastage)
- Limited no of user can be used according to divide the frequency.
- Less complex
- Analog
- cheap

TDMA
- Available spectrum is partitioned into narrow frequency bands or channels which in turn are divided into no of time slots.
- Each time slots only one users is allowed to either transmit or receive.

Features
- single carrier frequency for use for several users
- Duplexers are not required.
- Data transmission is not continuous
- Digital.
- used in GSM



CDMA = (code)
- message signal is multiplied by a very large bandwidth signal called spreading signal (PIN code)
- All user uses same carrier frequency and transmit simultaneously.
- Each user has its own PIN code.
- No Guard bands are required.

Features:-

(PIN) (code)

S1 (C1) $d_1 = G \times d_1$

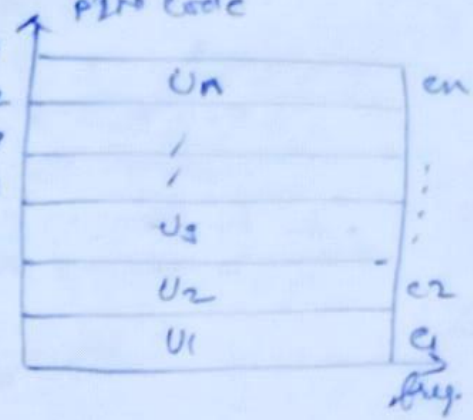
S2 (C2) $d_2 = C_2 \times d_2$

S3 (C3) $d_3 = C_3 \times d_3$

S4 (C4) $d_4 = C_4 \times d_4$

$(C_1 \times d_1) + (C_2 \times d_2) + (C_3 \times d_3) + (C_4 \times d_4)$

Single channel



- $C_1 \times C_2 = 0$
- $C_1 \times C_1$ = no of station code
- Latest

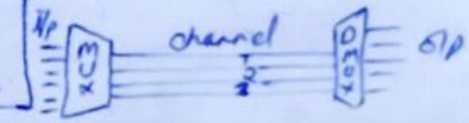
SDMA => (Space division Multiplexing Access) (or spatial division)
- multiple I/p multiple O/p.
- used wireless and satellite comm^n

Adv
- Best utilization of Bandwidth
- Provide good transmission

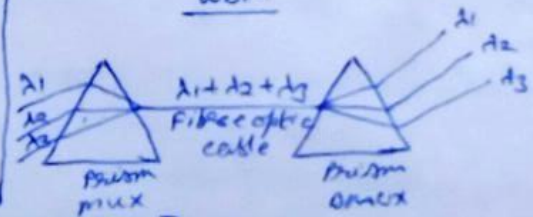
Disadv
- costly
- complicated in design
- Need services

Appl^n
- satellite comm^n
- optical "
- wireless "
- mobile "

FDM



WDM



TDM