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Subject : Mobile & Wireless Communication
(Assignment)

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Assignment

Multiplexing

It is a way of sending multiple signals or streams of informations over a communication link at the same time in the form of a single, complex signal.

Multiplexing is a method used by networks to consolidate multiple signals digital or analog into a single composite signal that is transported over a common medium such as radio wave or fibre optic cable. When the composite signals reaches its destination it is demultiplexed and the individual signals are restored and made available for processing.

It was introduced in the 1870s to support telegraphy but has since become a mainstay in telecommunications, such as radio, television and telephone. It is used in a wide range of industries to facilitate both analog and digital communications.

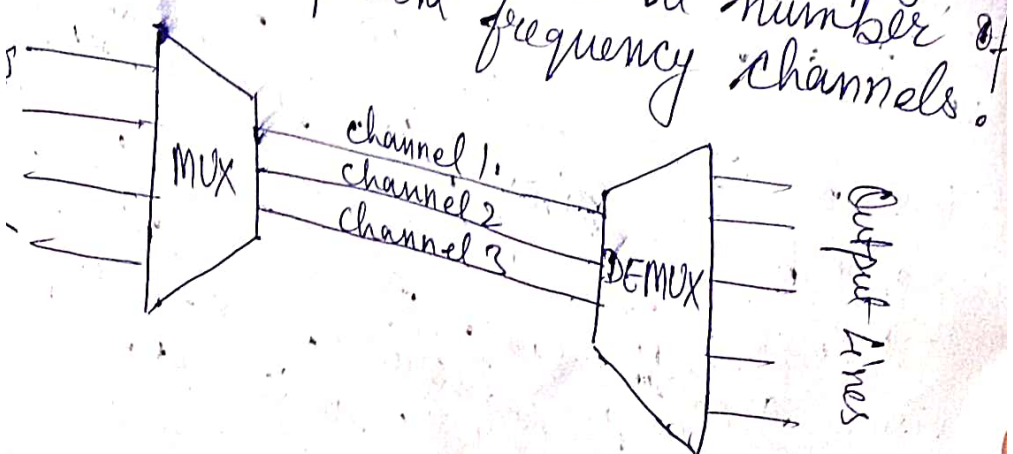
It is also used in computer n
often to transmit multiple signal
a wide area network.

Types of Multiplexing

There are three types of multiplexi

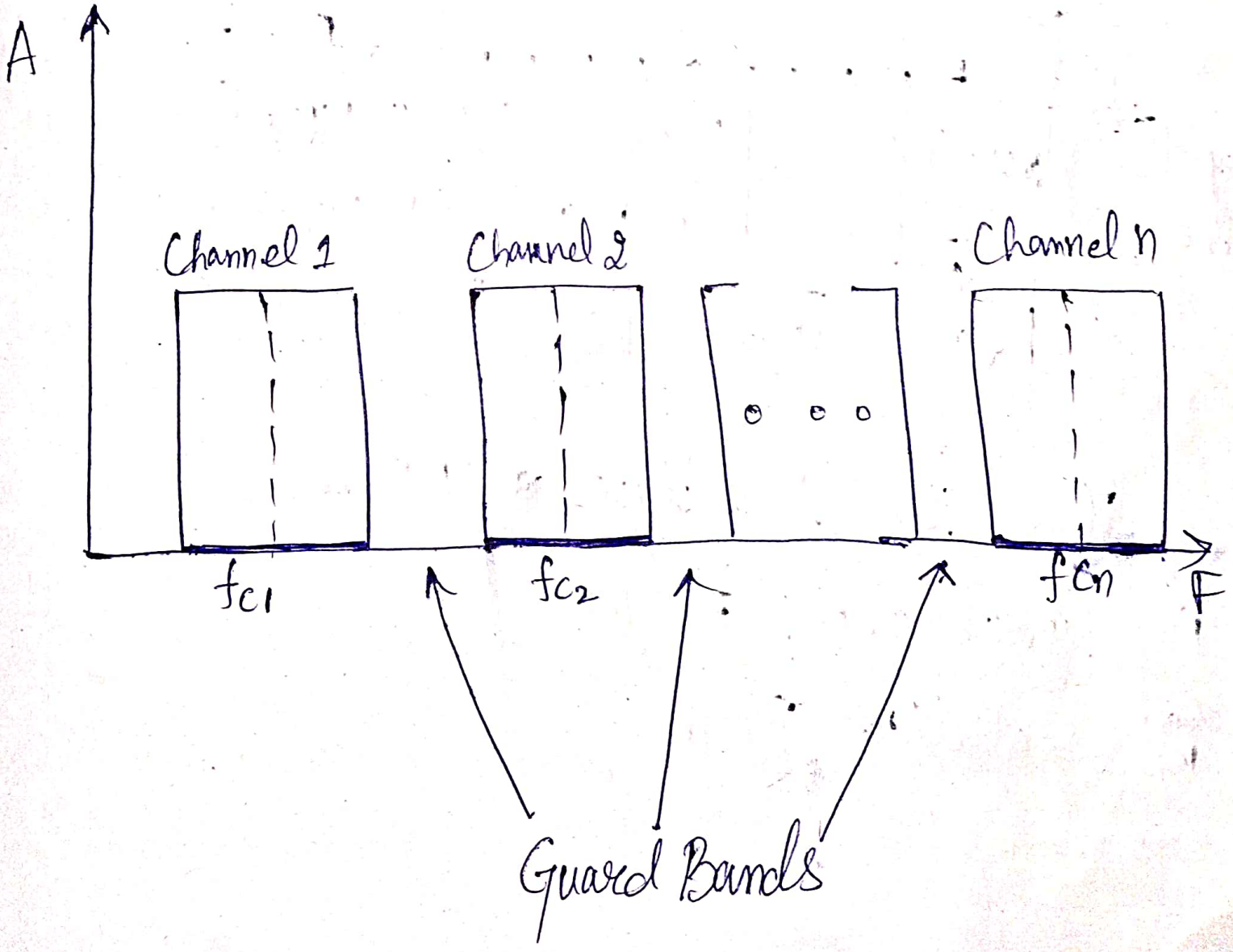
* Frequency Division Multiplexing (F

It is defined as a type of multiplex
where the bandwidth of a single physica
medium is divided into a number of
smaller, independent frequency channels.



FDM is ... transmission.

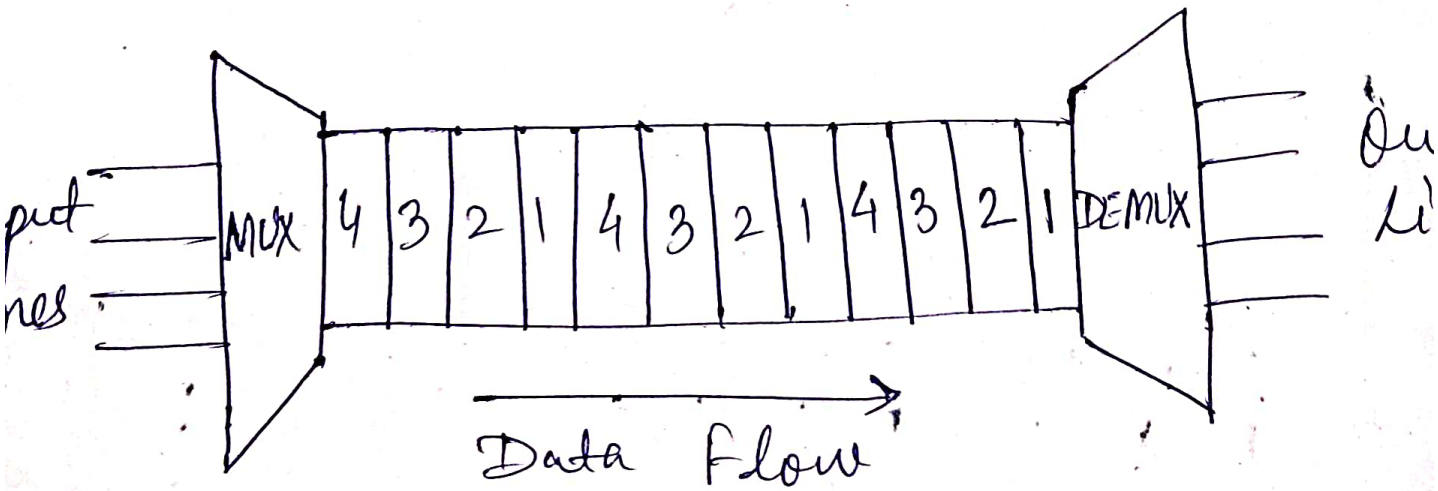
In FDM, we observe a lot of inter-channel cross-talk, due to the fact that in this type of multiplexing the bandwidth is divided into frequency channels. In order to prevent the inter-channel cross talk, unused strips of bandwidth must be placed between each channel. These unused strips between each channel are known as guard bands.



* Time Division Multiplexing (TDM)

It is defined as a type of multiplexing where in FDM, instead of sharing a portion of the bandwidth in the form of channels, in TDM, time is shared. Each connection occupies a portion of time in the link.

In TDM, all signals operated with the same frequency at different times



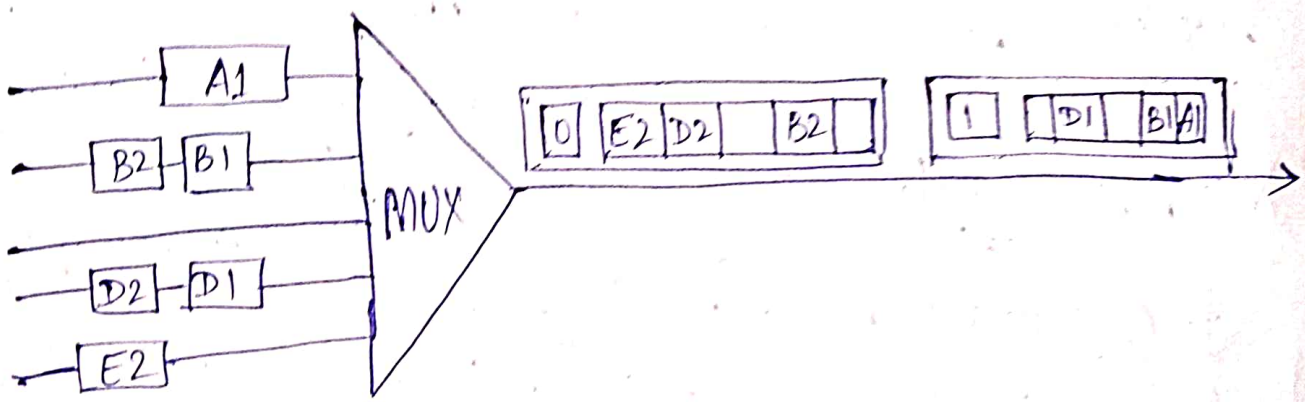
There are two types of TDM

1) Synchronous TDM
2) Statistical TDM

Synchronous TDM

It is a type of TDM where the input frame already has a slot in the output frame. Time slots are grouped into frames - One frame consists of one cycle of time slots. It is not efficient because if the input frame has no data to send, a slot remains empty in the output frame.

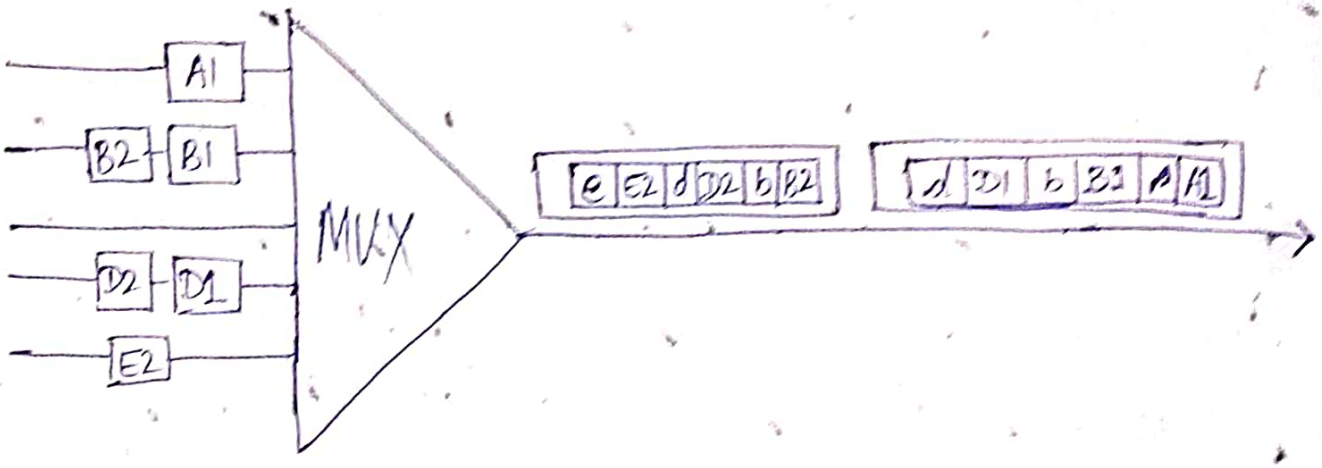
In synchronous TDM, we need to mention the synchronous bit at the beginning of each frame.



Statistical TDM

It is a type of TDM where the output frame collects data from the input frame till it is full, not leaving an empty slot like in Synchronous TDM.

In statistical TDM, we need to include address of each particular data in the slot that is being sent to the output frame.



Statistical TDM is more efficient type of TDM as the channel capacity is fully utilized and improves the bandwidth efficiency.

* Wavelength Division Multiplexing

It is used on fibre optics to increase the capacity of a single fibre. It is an analog multiplexing technique. Optical signals from the different sources are combined to form a wider band of light with the help of multiplexer. At the receiving end, the demultiplexer separate the signals to transmit them to their respective destinations.

Advantages of multiplexing

- It reduces circuit complexity and cost.
- We can implement many combinations logic circuits using multiplexers.
- It does not need k-maps and simplification
- On the advance level the ability of ~~mux~~ to switch directed s/g can be extended to sweter video s/g, audio s/g, etc.

Disadvantages of Multiplexing

Added delays in switching ports
Limitations on which ports can be used simultaneously.
Extra IO many require to control multiplexer.
Added delays in I/O signals propagating through the multiplexer.

Difference between FDM, TDM and WDM

FDM	TDM	WDM
It is a transmission technique in which several data signals that are combined for simultaneous transmission via shared communication medium.	It is a transmission technique that allows several users to send signals on a common channel by allocating a fixed time slot to each user.	It is a transmission technique that modulates numerous data streams, optical carrier signals of variable wavelengths in a single light beam passing through a single optical fibre.
hic FDM divides the dwidths into smaller quency ranges. Antrans- tsser transmits data ulltaneously via a nmon channel in ir frequency range.	TDM allocates a fixed time slot to each user to send signals via common channel. The user obtains all the bandwidth in this time slot.	The WDM combines several light beams from several channels and combines them into a single light beam and sends the through a strand of optical fibre similar to FDM
stands for Frequency vision multiplexing.	It stands for time division multiplexing.	It stands for wavelength division multiplexing.
uses analog signals	It uses digital and analog signals	It uses optical signals