

Unit - 2 : Physical Layer.

* Explain Multiplexing with its Types.

=> Multiplexing is a way of sending multiple signals over a communication links at a same time in the form of signals.

We can do two types of multiplexing. Analog and Digital Multiplexing.

In Analog Multiplexing there are two method.

ci) Frequency - Division Multiplexing
cii) Wave length Division Multiplexing.

ci) Frequency Division Multiplexing:

In this technique, signal of a medium is subdivided into several channels.

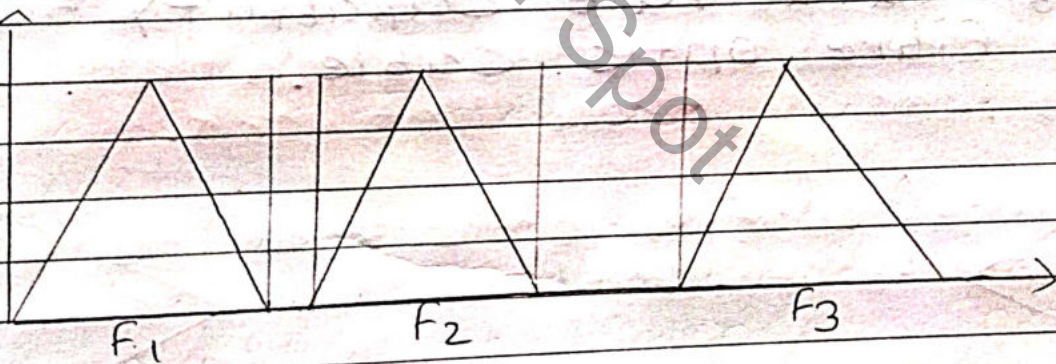
The input signals are translated

into frequency bands by using modulation method.

In FDM, available bandwidth is divided into frequency channels and allocated them to different devices.

FDM working process is very simple and does not require any synchronization.

FDM requires a large number of modulators and high bandwidth channel.



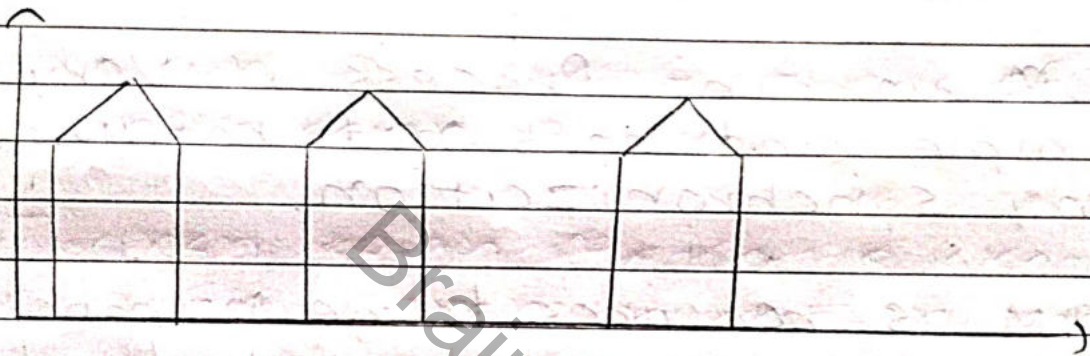
cii) Wavelength Division Multiplexing:

Wavelength Division Multiplexing are transmitted through the fiber optic cable.

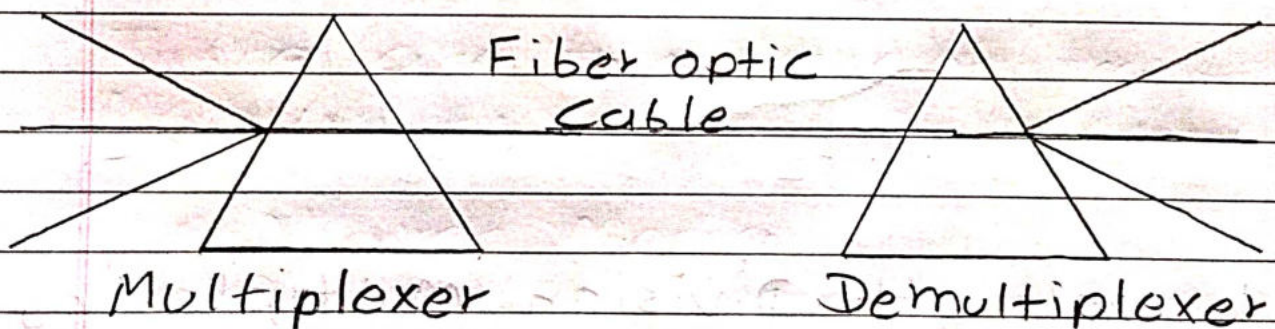
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WDM is used on Fiber optics to increase the capacity of a single fiber.

In this method Multiplexing and Demultiplexing are done using the Prism.



WDM is used to utilize the high data rate capability of fibre optic cable.



In Digital Multiplexing there are only one method is use

(i) Time Division Multiplexing

In this method, All the signals are operate at the same frequency with different time.

In this method, Data can be transfer One-by-One.

In this method, Signal are transmitted in the form of Frames.

There are two types of TDM.

(i) Synchronous TDM

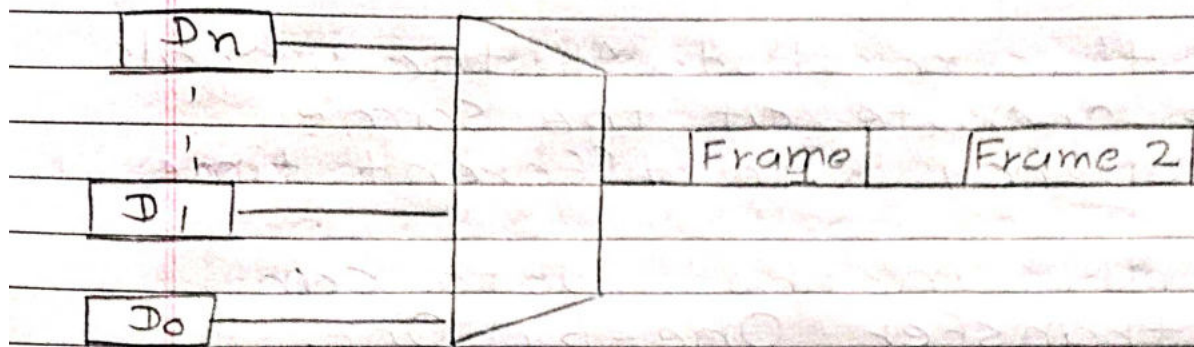
(ii) Asynchronous TDM

(i) Synchronous TDM:

In this method, time slot is predefined for every devices.

(ii) Asynchronous TDM:

In this method, time slot is not fixed for every devices.



* Explain different types of Transmission Media.

=> Transmission Media is used to provide communication medium between sender and receiver.

Transmission Media is used to carry the information in Local Area Network.

There are two types of transmission media.

- (i) Wired Media
- (ii) Wireless Media.

(i) Wired Media :

This are the different types of Wired Media.

- (a) Twisted Pair Cable
- (b) Coaxial Cable
- (c) Fiber Optic

(a) Twisted Pair Cable:

Twisted Pair Cable is type of Guided Media which made up of a pair of cables twisted.

Twisted Pair Cable is very cheap compare to other transmission media.

There are two types of Twisted Pair Cable:

- (1) Unshielded Twisted Pair
- (2) Shielded Twisted Pair

(1) Unshielded Twisted Pair:

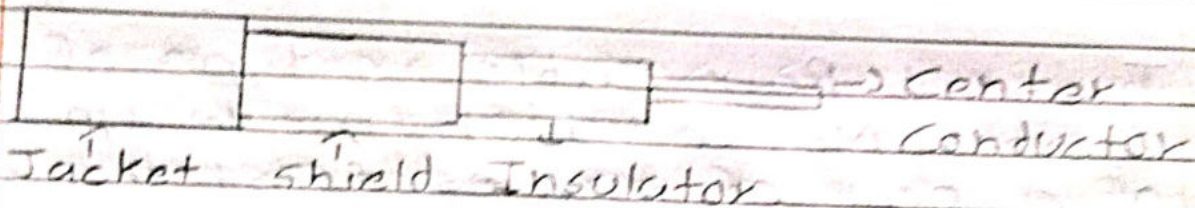
This cable is widely use for low-speed data transmission.

(2) Shielded Twisted Pair:

This cable has higher data transfer capacity compare to Unshielded Twisted Pair.

1b) Coaxial Cable :

Coaxial Cable is type of Guided Media which is used in TV wire.



Coaxial Cable has higher data transfer capacity compare to Twisted Pair cable.

The inner conductor is made up of copper and middle conductor is made up of non-conductive cover.

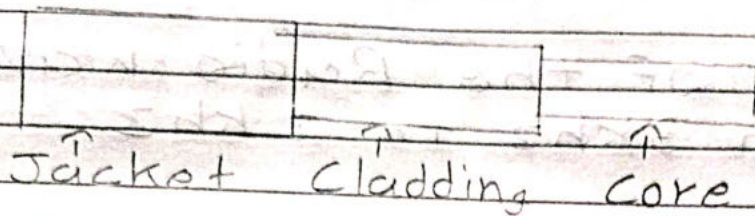
Coaxial Cable is more expensive compare to twisted Pair cable.

1c) Fibre Optic :

Fibre Optic cable is type of Guided Media which is used for electrical signals transfer.

Fiber Optic Cable has higher data transfer capacity among

the other transmission media.



Core is an inner most part of Optical Fiber cable which is used to transfer light.

Optical Fiber cable provides more bandwidth for transfer the data.

(ii) Wireless Media

These are the different types of wireless media.

(a) Radio Waves

(b) Micro Waves

(c) Infrared

a) Radio Waves :

Radio Waves is type of the Unguided Media which is used

to transfer electromagnetic waves.

Frequency of the Radio waves is between 3 kHz to 1 kHz.

When there is one sender and multiple receiver than we can use this cable.

Radio waves provides a higher transmission rate and covers a large area.

6 Microwaves:

Microwaves is a type of the Unguided media which is transfer electromagnetic waves.

Frequency of the Microwaves is between 1 GHz to 40 GHz

There are two types of Microwaves.

(1) Terrestrial Microwaves

(2) Satellite Microwaves

1. Terrestrial Microwaves:

Microwaves in the frequency range of 2 to 40 GHz are known as terrestrial microwaves.

2. Satellite Microwaves:

Microwaves in the frequency range of 1 to 10 GHz are known as satellite microwaves.

C. Infrared

Infrared is a type of unguided media which is used for short distance communication.

Frequency of the infrared is between 300 GHz to 400 THz.

Infrared supports high bandwidth so, it can transfer high rate of data.

Infrared provides better security with less interference.

* Difference between Synchronous and Asynchronous communication.

=> Synchronous Communication	Asynchronous Communication
1 Data can be transfer in form of Frames.	Data can be transfer in the form of bytes.
2 Provides fast data transmission.	Provides slow data transmission.
3 Transmission cost is expensive.	Transmission cost is economical.
4 No gap Present between data.	Gap is Present between data.
5 Time Interval is Constant.	Time Interval is Random.
6 Required complex hardware support.	Required less Hardware support.

* Explain ISDN.

=> ISDN stands for Integrated Services Digital Network which is used in telephone system.

ISDN is a one type of circuit-switched or packet-switched telephone network system.

The main Purpose of ISDN is used to digital transmission of voice and data.

There are two type of ISDN Services.

- (i) Narrowband ISDN
- (ii) Broadband ISDN

(i) Narrowband ISDN:

Narrowband ISDN is allows to transmit data upto the 64 kbps speed.

Narrowband ISDN is used circuit switching technology for the transfer the data and voice.

cii) Broadband ISDN:

Broadband ISDN is allows to transmits data upto the 100 kbps speed.

Broadband ISDN is used packet switching technology for transfer the data and voice.

→ ISDN Services:

ISDN Services is provide three types of Services.

a) Bearer Services

b) Tele Services

c) Supplementary Services.

a) Bearer Services:

This types of Services is used to transfer the information between users without changing the content.

This Services can not change the content information.

(b) Tele Services :

This types of service is used to transfer the information between user, may it changes the content.

This Services can be change the information content.

(c) Supplementary Services :

Supplementary Services is a combination of Tele services and Bearer Services.

This Service is provides additional functionality for transfer the data.

→ ISDN Architecture:

ISDN Architecture contain two type of part.

- (i) Channels
- (ii) Layers.

ci) Channels :

ISDN is contain three types of channels.

ca) B-channels

cb) D-channels

cc) H-channels

ca) B-channels :

B-channels is stands for Bearer channels.

B-channels is transfer information at the speed of 64 kbps data rate.

cb) D-channels :

D-channels is stands for Data channels.

D-channels is transfer the information at the speed of 16 to 64 kbps Data rate.

cc) H-channels :

H-channels is stands for Hybrid channels.

H-channel is used to transfer information between 1536 kbps data rate.

cii) Layers :

There are three types of Layers are used in ISDN.

ca) Physical Layer

cb) Data Link Layer

cc) Network Layer

ca) Physical Layer :

Physical Layer is used to provide Interface between B and D channel.

cb) Data Link Layer :

Data Link Layer is used to provide data link protocol for B or D channel.

cc) Network Layer :

Network Layer is used to provide different connection options for B or D channel.

→ Advantages of ISDN:

- 1 ISDN is provide higher data transfer rate and provides higher bandwidth.
- 2 ISDN channel Provides reliable connection.

→ Disadvantages of ISDN:

- 1 ISDN is requires specialized Digital services.
- 2 ISDN Services is costlier than the other telephone system.

* Explain ATM.

⇒ ATM stands for Asynchronous Transfer Mode which used to transfer the multiple services.

ATM is used to transfer the all the types of information such as data, video or voice.

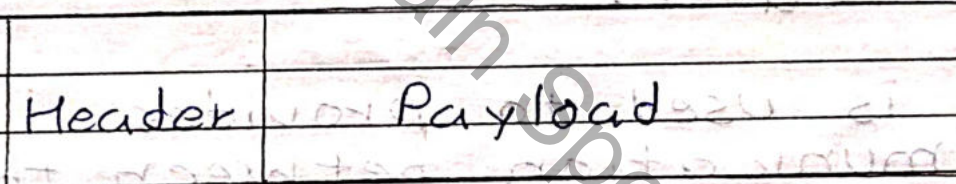
ATM is also know as evolution of packet switching.

In ATM, we have to use Packet switching method.

→ ATM Working :

In ATM all the transfer data is converted into the small Fixed size of packets which is also know as ATM cell.

ATM cells are transmitted in connection-oriented Network.



ATM Cell

ATM cell is Fixed-sized of units which content data.

Length of ATM cell is 53 bytes and it is divided into two Part Header and Payload.

Length of Header is 5 bytes and Length of Payload is 48 bytes.

ATM Can be used two types of format.

- (a) UNI Header
- (b) NNI Header

(a) UNI Header:

This is used to provide communication between ATM endpoints and ATM Headers.

(b) NNI Header:

This is used to provide communication between the ATM switches.

ATM Standard uses two types of connection.

- (a) Virtual Path Connection
- (b) Switches connection

(a) Virtual Path Connection:

Virtual Path connection consists of virtual channel connection.

A Virtual Path connection created between end-to-end across an ATM Network.

(b) Switches Connection.

Switches Connection is consist Virtual Path and Virtual Connection switches.

ATM Network is use three types of Layers

(1) ATM Adaption Layer

(2) Physical Layer

(3) ATM Layer

(1) ATM Adaption Layer:

ATM Adaption Layer is convert user data into the ATM cells into 48-byte cell payloads.

AAL Protocol excepts transmission from Upper-Layer Services.

(2) Physical Layer:

Physical Layer is manages the

medium-dependent transmission.

This layer is converts cells into a bitstream and tracks ATM cells boundaries.

c3) ATM Layer:

ATM Layer is handles the transmission and switching in the ATM Network.

* Explain Cellular Radio :

=> Cellular Radio helps mobile users to attach physical and data link layer protocol between mobile and base station.

Cellular Radio is used Cellular Network to connect with base station.

In Cellular Network all the stations are connected to Mobile Switching Center.

Cellular Network is used to manages call setup and handles mobility.

There are two techniques to shared mobile to base station radio.

- (i) Combined FDMA / TDMA
- (ii) CDMA

(i) Combined FDMA / TDMA :

FDMA stands for Frequency Division Multiple Access.

FDMA is divides the spectrum into the Frequency channels.

(ii) CDMA :

CDMA stands for Code Division Multiple Access.

CDMA is allows to reuse of the same spectrum over all cells.

For combination of FDMA and TDMA, we have to use GSM.

GSM stands for Global System for Mobile Communication which is used for mobile communication.

GSM is divided into 4 different size of cell.

- (i) Macro : This cell is used when base station antenna is installed
- (ii) Micro : This cell is used when antenna height is less than roof level.
- (iii) Pico : This cell is used for small cell diameter
- (iv) Umbrella : This cell is used to covers the shadowed regions.

GSM is support clear voice clarity and international roaming.

GSM is divided into Three Sub Systems.

(i) BSS

(ii) NSS

(iii) OSS

(i) BSS : BSS stands for Base Station Subsystems which handles the traffic between mobile phone and Network.

(ii) NSS : NSS stands for Networking and Switching subsystem which handles mobility management Functions.

(iii) OSS : OSS stands for Operating Subsystem which provides cost-effective support to customer.