SRI SAI RAM ENGINEERING COLLEGE

Department of Information Technology

Question & Answer – 2 Marks – CS1302 – Unit1

1. **Give components of a data communication system.**

Message, Sender, Receiver, Medium, Protocol

2. What is the purpose of twisting wires in a twisted pair cable.

Electromagnetic interference from devices such as motors can create noise over these wires. The wires closest to the noise source gets more noise voltage than the wire farther, this results in uneven load and damaged signal. **Twisting of wires make the load even and hence cancel the effect of noise.**

3. **What is RJ-11 & RJ-45 , what is RJ stands for**

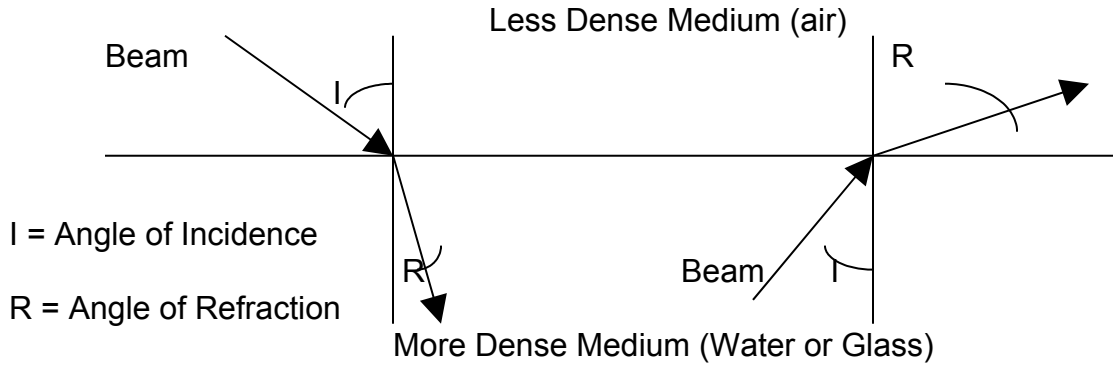
RJ stands for Registered Jack.

RJ11 is a 4 wire connector used for telephone cable

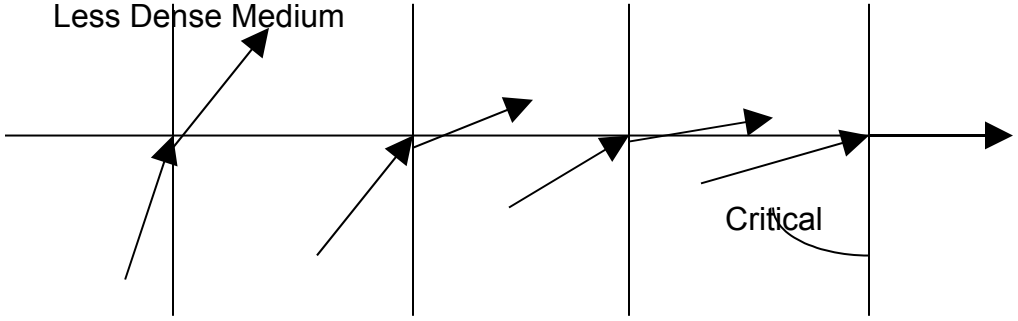
RJ45 is a 4 pair wire connector used for network cable

4. Define Critical Angle

When a light travels from more denser to less denser, the ray moves away from the vertical axis. As angle of incidence is gradually increased, angle of refraction also increases. At some angle of incidence the angle of refraction becomes 90 degrees. This angle of incidence is known as critical angle. When angle of incidence increases more than critical angle, beam gets reflected (complete reflection). Now the angle of incidence is always equal to the angle of reflection.



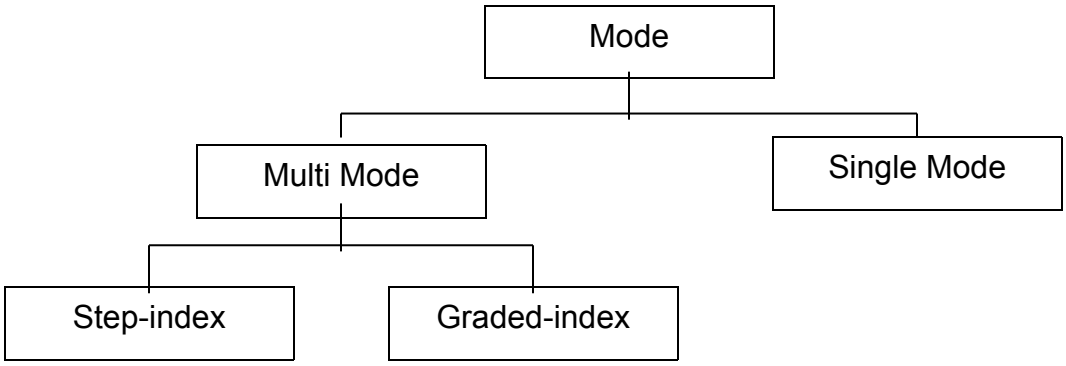
Critical Angle



Angle

More Dense Medium

5. Give different propagation modes in Optical Fiber.



Multimode : Multiple beams from a light source move through the core in different paths

Single mode : Uses step-index fiber and a highly focused source of light that limits the beam to a small range of angles, all close to the horizontal. Here Fiber is smaller diameter than multimode, with lower density.

6. Explain Multimode-Graded Index Fiber

Graded-index Fiber is with varying densities. Density is higher at the centre of the core and decreases gradually to its lowest at the edge.

The signal is introduced at the center of the core. Horizontal beam moves in straight line through the constant density at the center. Beams at the other angles move through a series of constantly changing densities.

Each density difference causes the beam to refract into a curve, also varying refraction varies the distance each beam travels in a given period of time, resulting in different beams intersecting at regular intervals.

Careful placement of the receiver at one of these intersections allows the signal to be reconstructed with good precision.

7. Explain Multimode-Step Index Fiber

Multimode graded-index Fiber decreases the distortion of the signal through the cable. Refractive index is related (proportional) to density

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refraction varies the distance each beam travels in a given period of time, resulting in different beams intersecting at regular intervals.
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8. Explain Single Mode Fiber.

Single mode **uses step-index fiber and a highly focused source of light** that limits the beam to a small range of angles, all close to the horizontal. Here Fiber is smaller diameter than multimode, with lower density.
The **decrease in density results in a critical angle that is close to 90 degrees** to make the propagation of beams almost horizontal.
Hence the propagation of different beams is almost identical and delays are negligible. All of the beams arrive at the destination together and can be recombined without distortion.

9. Give advantages of Optical Fiber.

Noise Resistance: Fiber uses light rather than electricity, no electromagnetic interference is possible. Light interference is taken care off by outer jacket.
Less Signal Attenuation : Signal can run miles without requiring regeneration.
Higher Bandwidth : Support very high BW, hence high data rates than other guided media.

10. Explain Shannon's Capacity

Shannon Capacity

$C = B \log_2 (1+S/N)$ = Shannon Channel Capacity in Bits/Sec (BPS)

B = Bandwidth
S/N = Signal to Noise Ratio

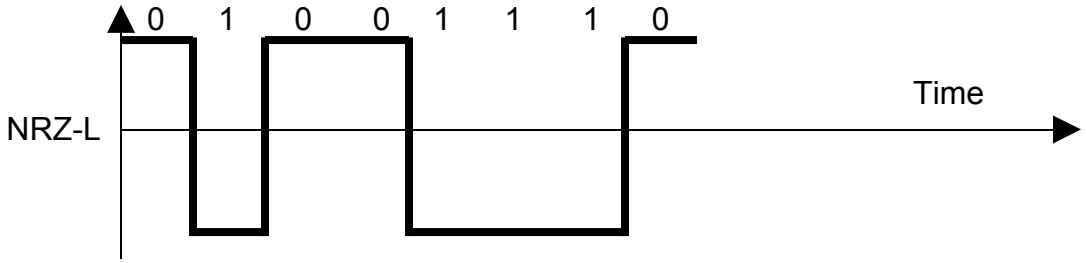
Ex : Tel Line Bandwidth = 3000 Hz (300 to 3300)

The S/N is usually be 3162 (35db)
The Channel Capacity (C) = $3000 * \log_2 (1+3162) = 3000 * \log_2 (3163)$
$= 3000 * 11.62 = 34{,}860$ bps

11. Explain NRZ-L encoding with diagram

NONRETURN TO ZERO-LEVEL (NRZ-L)
0 = HIGH LEVEL
1 = LOW LEVEL
A +VE VOLTAGE MEANS THE BINARY '0'
A –VE VOLTAGE MEANS THE BINARY '1' or VICE VERSA

THE LEVEL OF THE SIGNAL IS DEPENDENT UPON THE STATE OF THE BIT. **PROBLEM MAY ARISE WHEN THERE IS A LONG STREAM OF 1'S OR 0'S IN THE DATA**. THE RECEIVER RECEIVES CONTINUOUS VOLTAGE AND SHOULD DETERMINE HOW MANY BITS ARE SENT BY RELYING ON THE CLOCK, WHICH MAY OR MAY NOT BE SYNCHRONIZED.



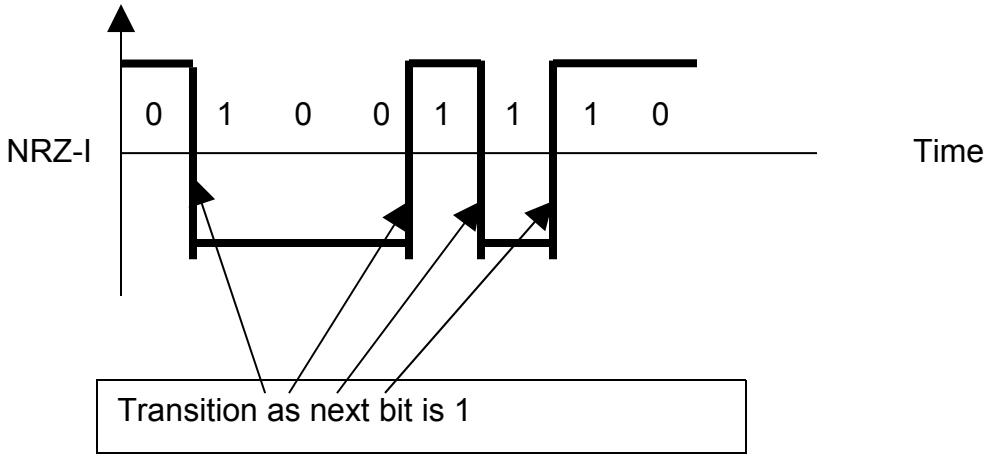
12. **Explain NRZ-I encoding with diagram**

NONRETURN TO ZERO INVERTED (NRZ-I) (INVERT ON '1s')

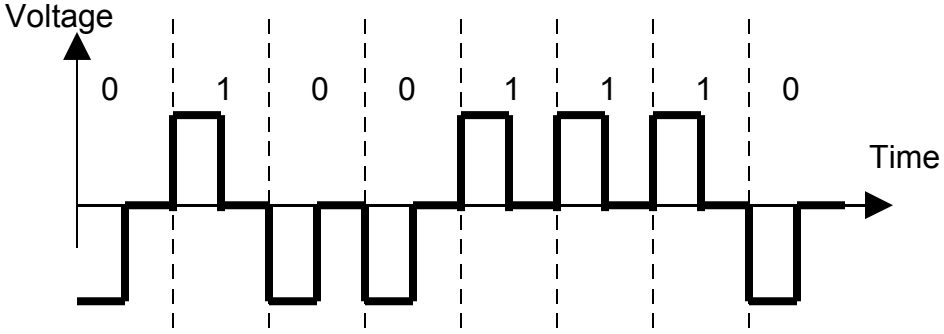
0 = NO TRANSISTION

1 = TRANSISTION BETWEEN '1' & '0' LEVEL AND '0' & '1'

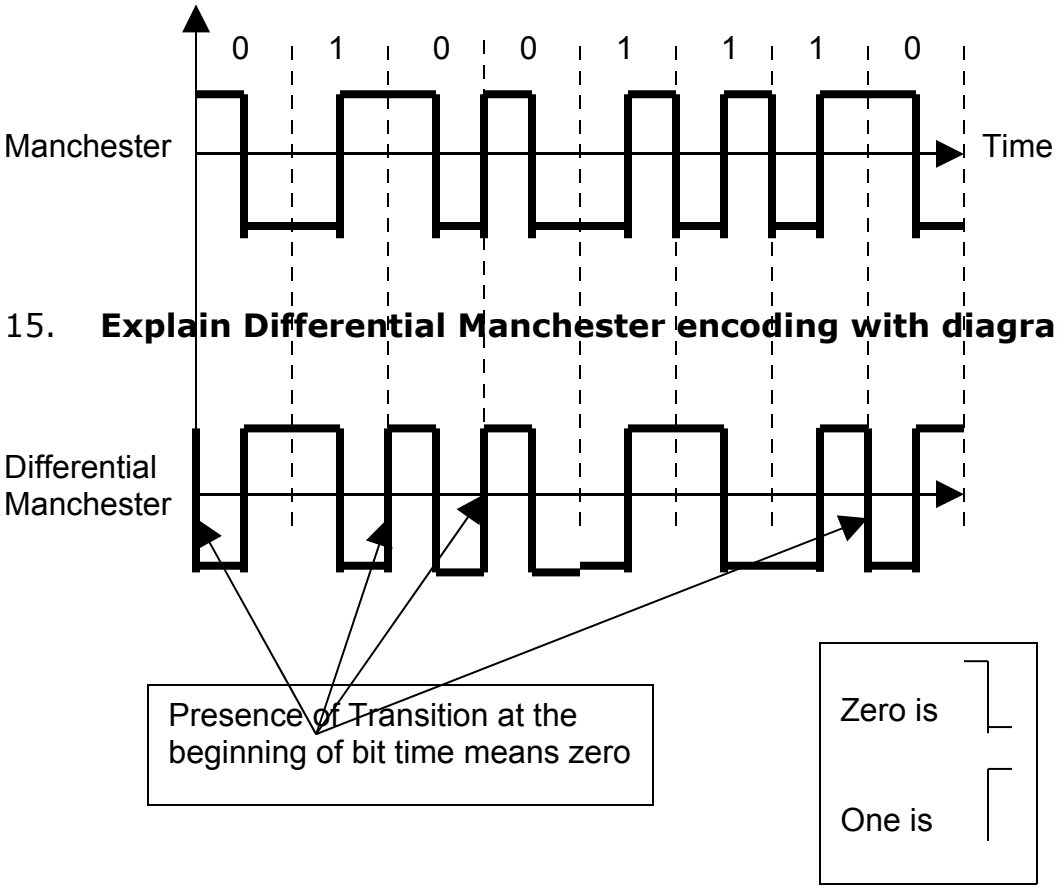
NRZ-I IS SUPERIOR TO NRZ-L AS SYCHRONISATION IS PROVIDED BY CHANGE IN VOLTAGE LEVEL EACH TIME BIT '1' IS ENCOUNTERED.



13. **Explain RZ encoding with diagram**



14. **Explain Manchester encoding with diagram**

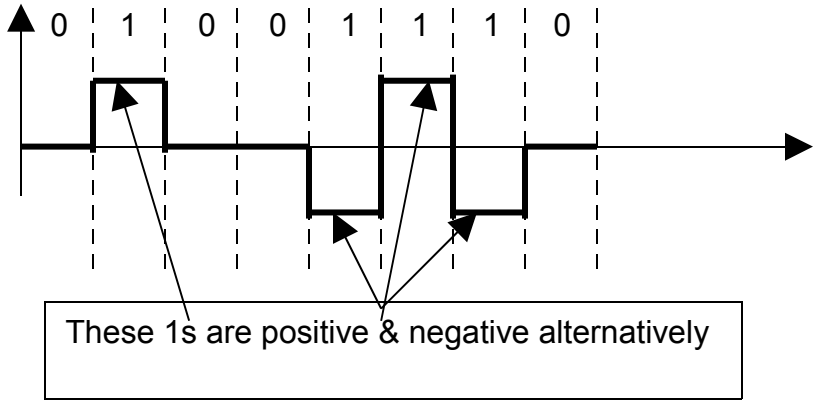


15. **Explain Differential Manchester encoding with diagram**

16. **Explain bipolar-AMI encoding with diagram**

0 = NO LINE SIGNAL

1 = +VE OR -VE LEVEL, ALTERNATING FOR SUCCESSIVE ONES



17. **Define QAM**

Quadrature Amplitude Modulation means combining ASK and PSK in such a way that we have maximum contrast between each bit, dibit, tribit, quadbit and so on.

18. **What is the difference between bit rate & baud rate.**

Bit rate is number of bits transmitted per second

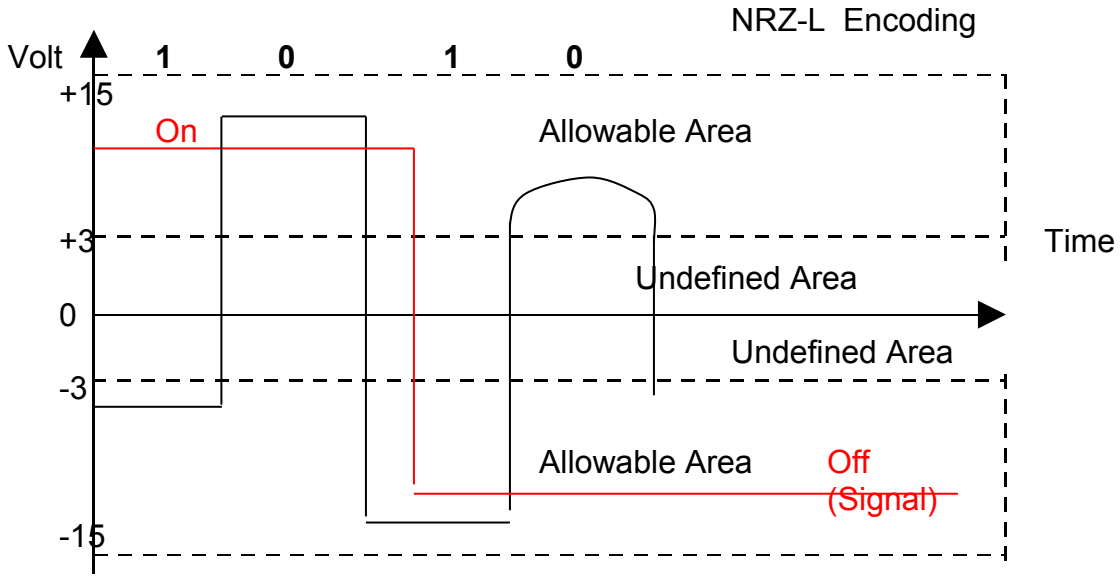
Baud rate is number of signals transmitted per second. If a signal is represented by 2 bits then the baud rate is half of bit rate

19. **Define DTE & DCE**.

DTE : Data Terminal Equipment - Say a Computer

DCE : Date Circuit terminating Equipment – say MODEM

20. **Give electrical specification of the signals to be transmitted in RS 232**



21. **Give the signal associated with the following pins of RS232-25 pin**

1. Shield 2. Transmit Data
3 Receive Data 4. Request to Send
5 Clear to Send 6. DCE Ready
7. Signal Ground 8. Received Line Signal Detector
17. Receiver Signal Element Timing 20 DTE Ready 24 Transmitter Signal Element Timing

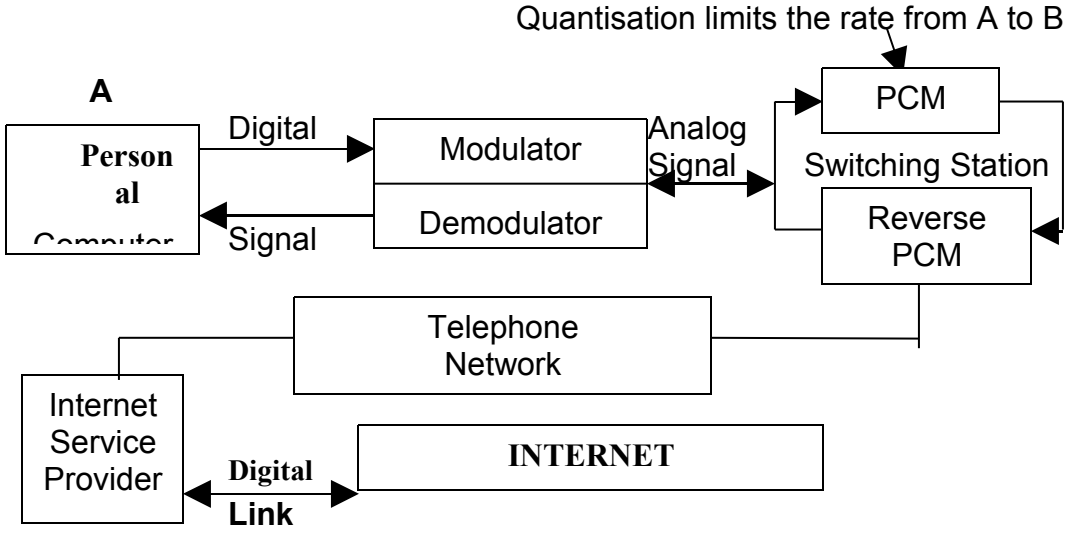
22. **What is a null modem.**

Suppose you need to connect two DTEs in the same building, for example, two work-stations or a terminal to a workstation. Modems are not needed to connect two compatible digital devices directly; the transmission never needs to across analog lines, such as telephone lines, and therefore does not need to be modulated. But you do need an inter-face to handle the exchange (readiness establishment, data transfer, receipt, etc.), just as an EIA-232 DTE-DCE cable does.

The solution, provided by the EIA standard, is called a null modem. **A null modem provides the DTE-DTE interface without the DCEs**.

23. **How 56 KHz speed is possible in modem**.

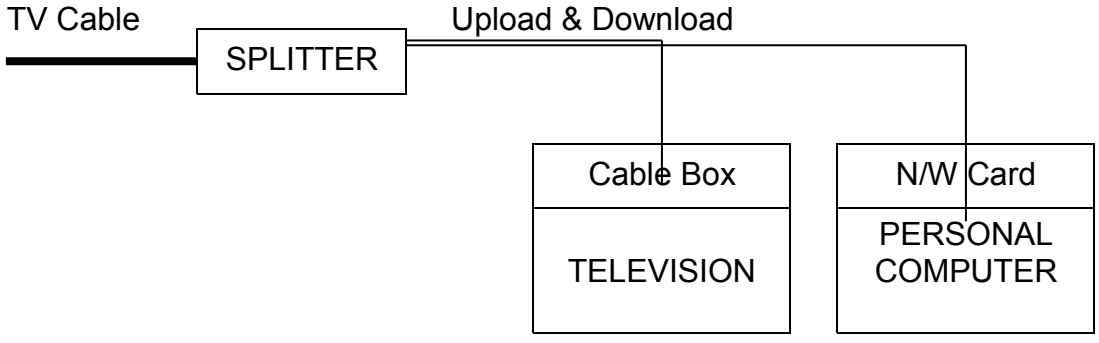
If one side is an Internet provider and the signal does not have to pass through a PCM converter, quantization is eliminated in one direction and the data rate can be increased to 56 Kbps.



24. **What is cable modem**.

Cable TV provides residential premises with a coaxial cable that has a bandwidth up to 750 MHz and sometimes even more. This bandwidth is normally divided into 6 MHz bands using frequency division multiplexing. Each band provides a TV channel. **Two bands can be set aside to allow a user to download and upload information from the Internet.**

Figure below shows the **cable modem** concept. Instead of the traditional cable box, we show a splitter. The splitter directs the TV bands to the TV set and the Internet access bands to the PC.



Downloading

Downloading usually requires a 6 MHz bandwidth in a range above 40 MHz. The demodulation technique used is 64-QAM (6 bits at a time). This means that a user can download information at a rate of

6 MHz x 6 = 36 Mbps

However, PCs are not yet capable of receiving data at this rate. Presently, the rate is something between 3 and 10 Mbps.

Uploading

Uploading requires a 6 MHz bandwidth in a range below 40 MHz. At this low frequency, home appliances can create a noisy environment that affects modulation. The modulation technique that is normally used is QPSK (2 bits at a time). This means that a user can upload information at a rate of

6 MHz x 2 = 12 Mbps

Presently, the uploading rate is between 500 Kbps and I Mbps.

25 **What is the difference between half duplex and full duplex communication.**

Half Duplex : Each station can transmit and receive but only one at a time

Full Duplex : Each station can transmit and receive simultaniously

26 **List the basic criteria for communication network system.**

Performance, Reliability and Security

27 **List the topologies of network**

Mesh, Star, Bus, Ring and Tree

28 **What are the categories of network**

Local Area Network(LAN), Metroplitan Area Network(MAN), Wide Area Network(WAM)

29 **What is Protocols**

Protocols : Rules

A set of rules that governs/defines what, when and how data is communicated between two entities.

The key elements of the protocol are Syntax, Semantics and Timing

Syntax : Refers to the structure or format of the data **ie** order in which data is presented. Ex First 2 bytes represents sender address, next 2 bytes destination address, rest is message.

Semantics : Refers to the meaning of each section of the structure. Ex if flag M is set, then more segments are to come.

Timing : Refers to when data to be sent and how fast they can be sent

30 **What is Standards**

Standards : Agreed upon Rules

Standards are essential in creating and maintaining an open and competitive market for eqpt manufacturers and service providers in guaranteeing national and international interoperability of data, technology and process.

Provide guidelines to manufacturers, vendors, service providers and government agencies to ensure the kind of interconnectivity necessary.

Two categories of data communication standards are

1. De Facto Standard : Standards that have not been approved by organized body, but have been adopted as standards through widespread use.

2. De Jure Standard : Standards that have been legislated by an officially recognized body.

Standards Organisation

Standards Creation Committees

- International Standards Organisation (ISO)
- International Telecommunication Union- Telecommunication Standards Sector (ITU-T)
- American National Standards Institute (ANSI)
- Institute of Electrical and Electronics Engineers (IEEE)
- Electronic Industries Association (EIA)

Forums : To accommodate the need for working models and agreements and to facilitate the standardization process , special interest groups have developed forums made up of representatives from interested corporations, The forum works with universities and users to test, evaluate and standardize new technologies

Regulatory Agencies : All communication technologies are subject to regulation by government agencies such as Federal Communications Committee (FCC) in US.

Internet Standards : Internet standard is a thoroughly tested specification that is useful and is adhered by those who work with internet.

A specification begins as an internet draft which is an working document with no official status and 6 month life time.

Upon recommendations from internet authorities a draft may be published as Request For Comment (RFC)