



Summer – 14 EXAMINATION
Model Answer

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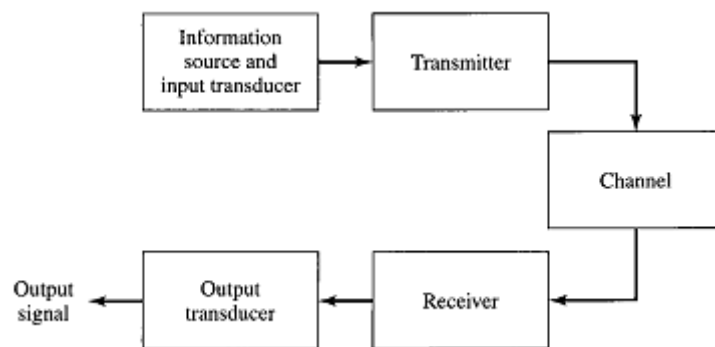
Important Instructions to examiners:

- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills).
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
- 6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.

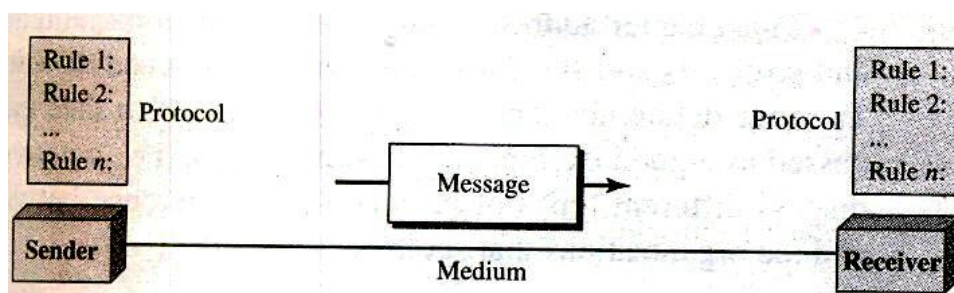
Q.1.

a) Attempt any three:

- a) With neat sketch, describe any two components of data communication network.
(diagram 2 marks, 1 mark for explanation of each component- any 2)**



OR



Information source: - It generates data which to transmitted using network.



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Ex. Telephone device, PC

Transmitter:- It is responsible for modulating & encoding incoming data from source into format in which medium is capable to send .

Communication channel:- The communication channel is medium used for transmission of electronic signals from source to destination .The communication medium may be wires ,OFC, or Free space

Depending on type of communication medium it is categorized in two types as follow

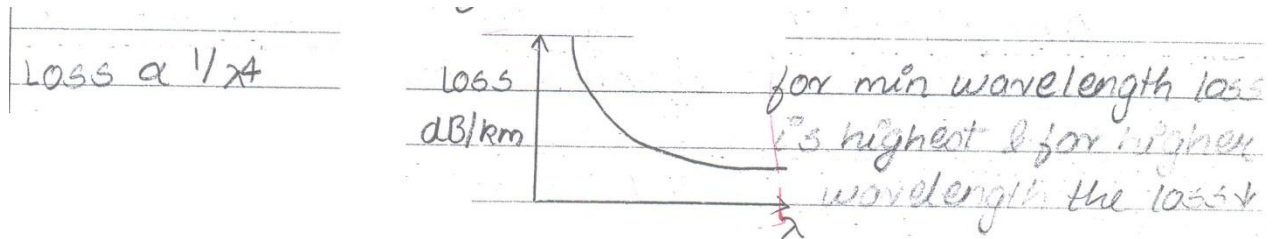
- 1) Guided (wired)
- 2) Unguided (wireless)

Receiver:-It accepts encoded /modulated information from transmission line or network &decodes/demodulates it into digital data.

Protocol:- It is a set of rules for communication between two networked computers.

b) State the scattering losses in optical fiber.(4 Marks)

Due to manufacturing defects some sub microscopic irregularities are formed in OFC. Light ray propagating through these cable when strikes to these impurities they are diffracted. Due to this diffraction, light ray gets disperse out in many direction .Some dispersed ray travels through core & some escapes through cladding & power losses due to these escaped light rays are called as Rayleigh scattering losses. The scattering loss is inversely proportional to the 4th power of wavelength of the light ray incident



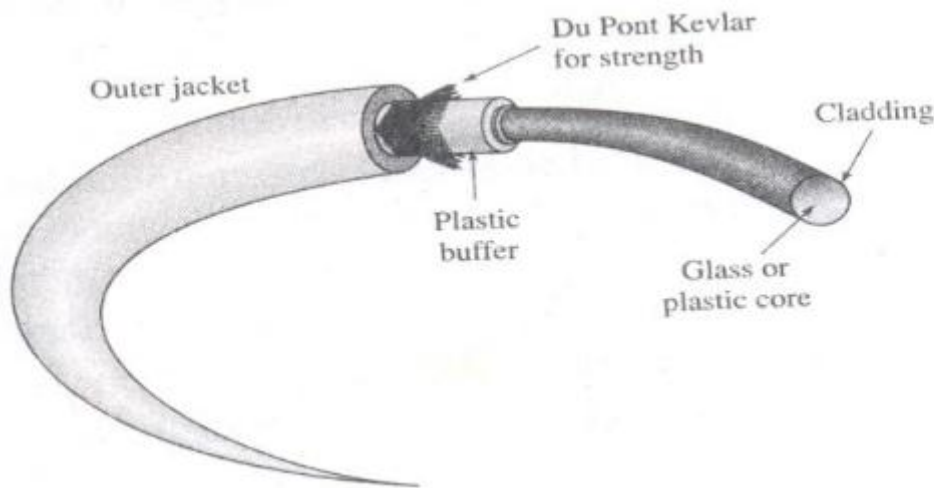
**c) Describe the construction of optical fiber cable.
(2marks for description, 2 marks for diagram)**

A highly refined quartz tube that is filled with combination of gases (silica tetra chloride, germanium tetra chloride etc.) is selected to start the process. This tube about 4 ft. long 1 inch diameter is placed in a lathe and these gases are injected into the hollow tube. The tube is rotated over a flame and subjected to temp of about 1600° F. The burning of the gases produces deposits on the inside of the tube. The quartz tube is said to have undergone modified chemical vapor deposition MCVD. This performed quartz is then heated to about 2100°F melting and collapsing the tube to about 13 mm. This preformed quartz is now ready to be placed in vertical drawing tower where it is further heated to 2200°F and drawn downward by means of a computer controlled melting and drawing process which produces fine, high quality fiber thread having 125 micrometer diameter and about 6.25 km in length. The optically pure center called core is surrounded by less optically pure quartz called cladding.

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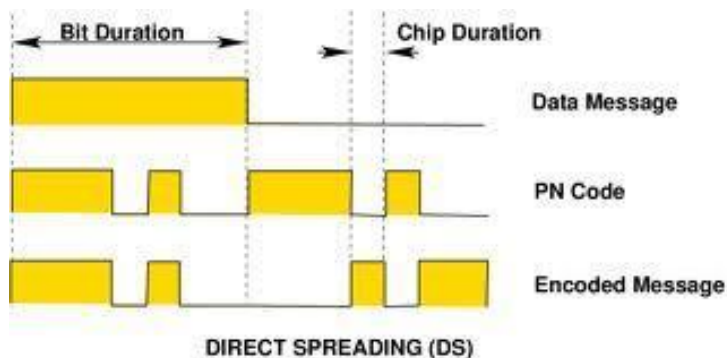
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d) Explain concept of DSSS. Give its two advantages.
(Description 2 marks, Advantages 2 marks)

- 1) Direct sequence spread spectrum, is one of two approaches to spread spectrum modulation for digital signal transmission over the airwaves.
- 2) In direct sequence spread spectrum, the stream of information to be transmitted is divided into small pieces, each of which is allocated across to a frequency channel across the spectrum.
- 3) DSSS multiplies the data bits by a very fast pseudo-random bit pattern (PN sequence) that "spreads" the data into a large coded stream that takes the full bandwidth of the channel.
- 4) In Direct Sequence-Spread Spectrum the baseband waveform is XOR by the PN sequence in order to spread the signal. After spreading, the signal is modulated and transmitted. The most widely modulation scheme is BPSK (Binary Phase Shift Keying).
- 5) A data signal at the point of transmission is combined with a higher data-rate bit sequence (also known as a *chipping code*) that divides the data according to a spreading ratio.
- 6) The redundant chipping code helps the signal resist interference and also enables the original data to be recovered if data bits are damaged during transmission.



- 7) Direct sequence contrasts with the other spread spectrum process, known as frequency hopping spread spectrum, or frequency hopping code division multiple access (FH-CDMA), in which a broad slice of the bandwidth spectrum is divided into many possible broadcast frequencies.



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8) In general, frequency- hopping devices use less power and are cheaper, but the performance of DS-CDMA systems is usually better and more reliable.

Advantages:- (any two –any other relevant can be considered)

- 1) The chip rate is much higher than the information signal bit rate.
- 2) More Secure than FHSS
- 3) Provides more Throughput than non-synchronized FHSS

b) Attempt any One:

- a) Describe cyclic redundancy check with an example.**
(3 marks description, 3 marks example)

A CRC code word of length l with n -bit data word is referred to as (l, n) cyclic code and contains $(l-n)$ check bits.

These check bits are generated by module – 2 divisions. The dividend is the data word followed by $r = l - n$ Zeroes and

The divisor is a special binary word of length $r \times l$. The CRC code word is formed by mod -2 addition of dividend and

The remainder.

Step by step procedure:

1. Append a string of r zeros to the data word where r is less than the number of bits pre decided divisor by 1 bit i.e. if divisor = 5 bits then $r = 4$ zeros.
2. Divide the newly generated data unit in step 1 by the divisor. It is binary division
3. The remainder obtained after division is the r bit CRC.
4. This CRC will replace the r zeros appended to the data unit to get the codeword to be transmitted.

E.g. To Generate CRC for the data word 110101010 using the divisor 10101

Data Word – 110101010

Divisor – 10101

$L - r = 4$

4 zeros added

eg. Generate CRC Code for the data word 110101010 using the divisor 10101

Data word - 110101010
Divisor - 10101

$L - r = 4$
∴ 4 zeros added

divisor = $r + 1$

10101) 1101010100000

10100100

010110

10101

000011000

10101

01100

1011 +
1100

Thus the data word sent is 1101010101100

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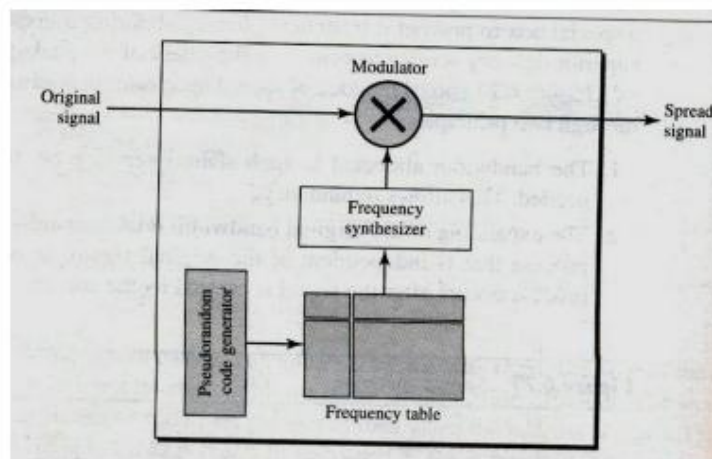
b) Describe the concept of IEEE802.11 FHSS.

(Explanation 3 marks, 3 marks diagram)

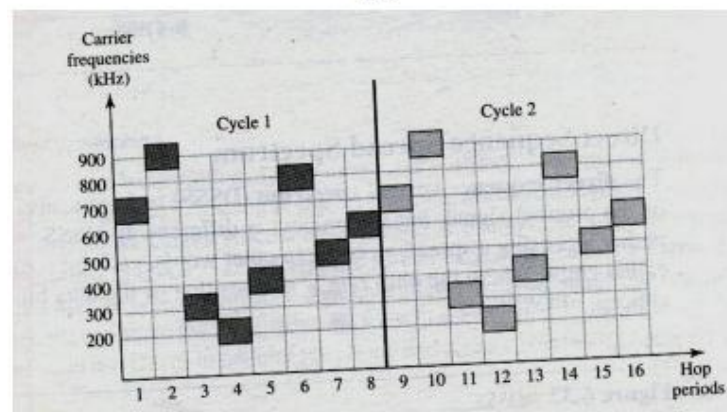
Frequency Hopping Spread Spectrum:

- It is physical layer specification of 802.11 for transmission
- It divides bandwidth in to N frequency bands
- It sends data using one carrier frequency for short span of time then changes to another frequency
- If the bandwidth of original signal is B the allocated spread spectrum bandwidth is $N \times B$
- Changing from one frequency to another make it difficult to unauthorized person to make sense of transmitted data.
- In FHSSS sender & Receiver agrees on sequence of allocated band.
- In FHSS, a pseudorandom code generator called pseudorandom noise (PN) creates k-bit pattern for every hopping period. The frequency table uses pattern to find the frequency to be used for this hopping period & passes it to the frequency synthesizer.

The frequency synthesizer creates a carrier signal of that frequency and source signal modulates the Carrier signal.



OR



Transmission



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Q.2. Attempt any six of the following:

- a) **Describe Asynchronous Transfer Mode with respect to switching mode, packets size, ATM cells and ATM layer.**

Switching Modes:- (2 marks)

ATM switching is done using

(per mode 1 mark)

- a) VP-switch

- b) VPC –switch

- a) **Switching using VP switch:-**

(1mark)

It routes the packets based on VPI only. It maintains routing table having Incoming Interfaces & outgoing interfaces depending on VPI Value

Incoming		outgoing	
Interface	VPI	Interface	VPI
1	37	4	78
.			
.			

- b) **Switching Using VPC:-**

(1 mark)

It routes packets depending on combined values of VPI&VCI .It maintains routing table having Incoming Interfaces & outgoing interfaces depending on VPI & VCI Values

Incoming			outgoing		
Interface	VPI	VCI	Interface	VPI	VCI
1	37	10	4	78	92
.					
.					

ATM Packet size:-

(2 marks)

In ATM size of packet size is fixed. The size of ATM packet is of 53 Bytes.

In packet 48 bytes are reserved for payload (i.e. data). ATM packet have 5 byte header.

Header	Data
5 bytes	48 bytes

ATM cell:-

(2 marks)

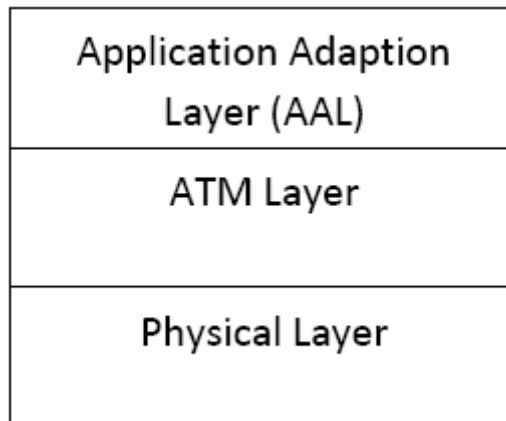
There are 2 types of ATM cell formats.

1. UNI: User –to- network Interface cell
2. NNI: Network -to -Network Interface cell



ATM Layers:-

(2marks- 1 mark for diagram and 1 mark for explanation)



The ATM protocol consists of three layers, as shown in Fig. these layers are physical layer, ATM Layer and Application Adaptation Layer (AAL). Let us discuss these layers now.

Physical layer: like all other networking protocols, the ATM physical Layer deals with optical interfaces and encoding techniques. This enables transformation of ATM cells into raw bits, which can be transmitted across a transmission medium (usually a wire).

ATM Layer: The ATM layer deals with cell routing, switching, multiplexing and traffic management. The core area of the ATM layer is the definition of the ATM cell, The ATM cell is defined in the ATM layer. The ATM layer accepts 48-byte AAL segments from the AAL layer, and adds the 5-byte cell header to transform the segment into a 53-byte ATM cell that can be delivered to physical layer

Application Adaptation Layer (AAL): the AAL facilitates an interaction between the existing networks and ATM. At the incoming end, the AAL layer accepts data from the higher layers and divides it into 48 byte segments and hands over to ATM layer which adds a 5 byte header to form a 53 byte ATM cell. The incoming frames can be circuit/packet switched, can have fixed /variable data rate, and can represented voice/data/other transmission types. At the outgoing end, the AAL transforms fixed-size ATM cell into appropriate protocol frames.

- b) Describe Datagram approach of packet switching with suitable example. What are its advantages and disadvantages over virtual circuit approach?**
(2 marks diagram, 2 marks description, 2 marks example, 1 mark advantages &1 mark -disadvantages)

2 marks description

In datagram approach through packet switching each packet is treated independently from all others

Even when 1 packet represents just a piece of multi packet transmission, the network treats it as though it

Exists alone. Packets in this technology are referred to as datagram.

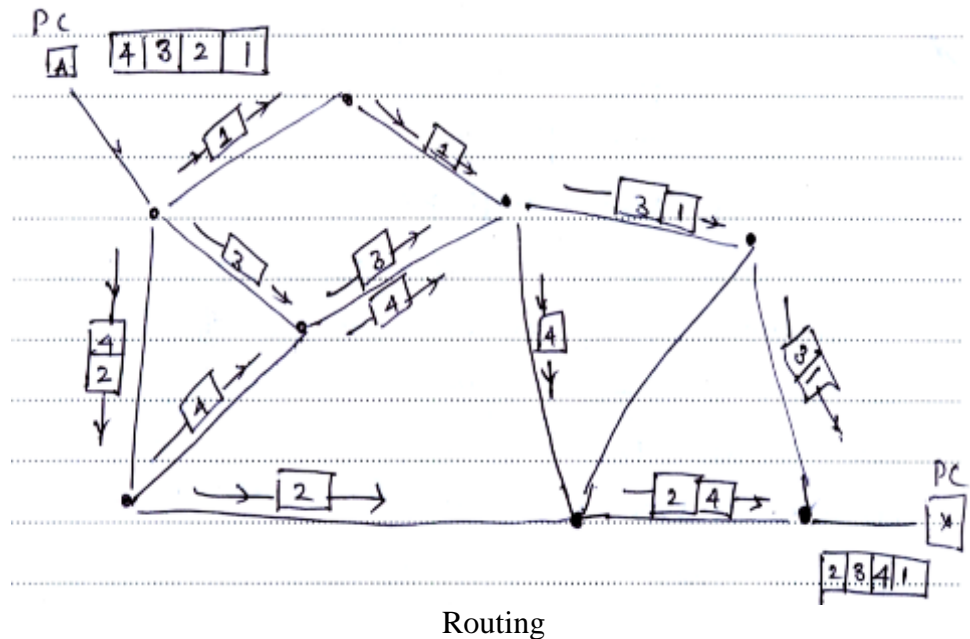
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2 marks example



The fig. shows how datagram approach can be used to delivery of four packets from station A to Station X. All the four datagram belong to the same message, but may go by different path to reach their destination. This can cause the datagram transmitted to arrive at the destination out of order. It is the responsibility of the transport layer of the protocol to reorder the datagram before passing then to the destination port. The link joining each pair of node can contain multiple channels. Each of these channels is capable of carrying datagram from different sources or one source. Multiplexing can be done using TDM or FDM.

The main advantages are (2 marks advantages &disadvantages, any 2 points each)

- Call setup phase is avoided
- If congestion develops in one part of the network incoming datagram can be routed away from congestion
- It is highly reliable. If a node fails subsequent packets may find alternate route that will bypass that node.

Disadvantages:-

- Slower compared with virtual circuit
- Requires entire destination detail in every packet

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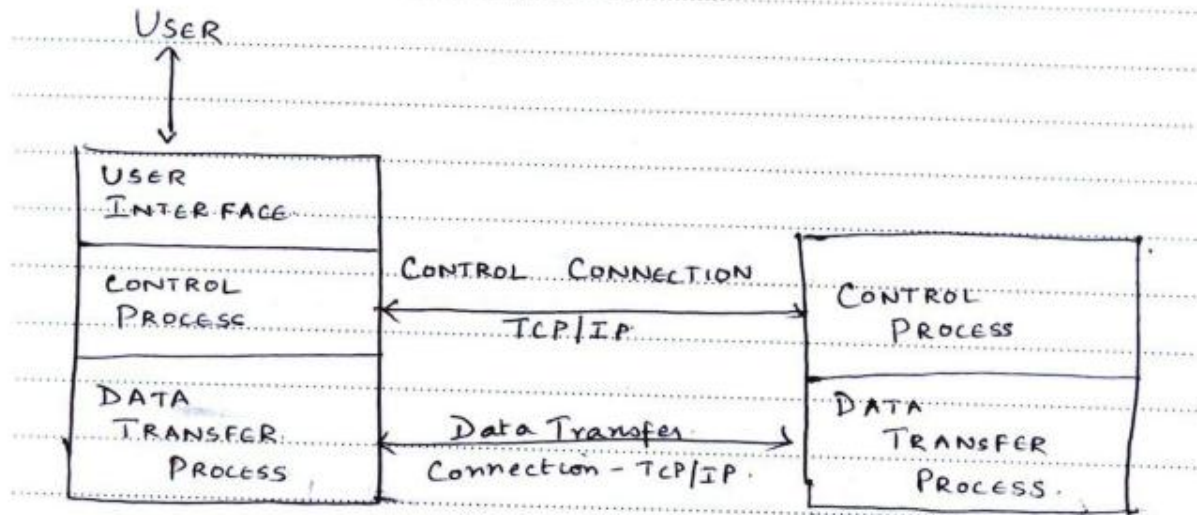
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- c) **Explain FTP and state its applications. State FTP URL scheme designate for life. Give example and explain.**

(2 marks diagram, 2 marks explanation, 2marks Application, 2 marks URL scheme with example)

FTP is a high level application layer protocol that is aimed at providing a very simple interface for any user of the internet to transfer files.



FTP presents the user with a prompt and allows entering of various commands for accessing and downloading files that physically exists on a remote compute. The user identifies a remote computer and instructs FTP to establish a connection with it. FTP contacts the remote computer using the TCP/IP software. Once the connection is established, the user can choose to download a file from the remote computer or the user can send the file from the user end to be stored on remote computer. FTP uses two connections between a client and server.

1. Data transfer
2. Control information – for commands and responses

This makes FTP more efficient

The client has three components

- i. User interface
- ii. Client control process
- iii. Client data transfer process

FTP application:-

2marks

Application

FTP is used to transfer file over LAN. FTP can be used to transfer file (data) in between system with different file name conventions, different encoding

FTP URL Scheme :-

2 marks URL scheme with example

The FTP URL scheme is used to designate files and directories on Internet hosts accessible using the FTP protocol. A FTP URL follow the syntax described below. If <port> is omitted, the port defaults to 21.



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<ftp://<user>:<password>@<host>:<port>/<cwd1>/<cwd2>/.../<cwdN>/<name>;type=<typecode>>

Ex. <URL:ftp://foo:@host.com/>

Here username is foo & password is empty
host

The fully qualified domain name of a network host, or its IP address. The port number to connect to. Most schemes designate protocols that have a default port number.

url-path

The rest of the locator consists of data specific to the scheme, and is known as the "url-path". It supplies the details of how the specified resource can be accessed. Note that the "/" between the host (or port) and the url-path is not part of the url-path.

The url-path syntax depends on the scheme being used, as does the manner in which it is interpreted.

Each of the <cwd> elements is to be supplied, sequentially, as the argument to a CWD (change working directory) command.

Q.3. Attempt any four:

- a) **Describe working of Frame Relay. (Appropriate Working- 2marks & diagram = 02 Marks)**

Working of Frame Relay:-

In Frame Relay implementation, the connection between a DTE (router) device and a DCE (Frame Relay switch) device consists of both a physical layer component and a link layer component:

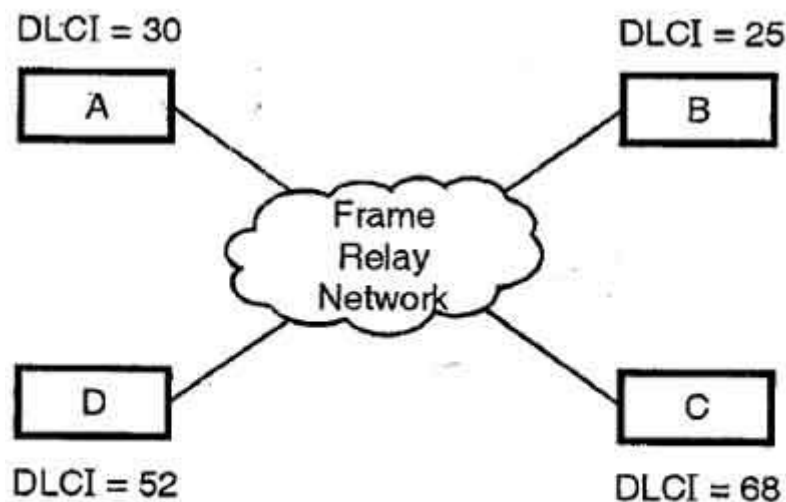
- i. The physical component defines the mechanical and electrical specifications for the connection between the devices.
 - ii. The link layer component defines the protocol that establishes the connection between the DTE device, such as a router, and the DCE device, such as a switch.
- 1) Frame relay can support the Permanent Virtual Circuit (PVC) as well as Switched Virtual Circuits(SVC). Whether to use PVC or SVC is decided by the user, based on the data transmission requirements.
 - 2) The Frame relay works on the basis of virtual circuits. These virtual circuits are created and used in the data link layer. Each virtual circuit is identified by a number called Data Link Connection Identifier(DLCI)
 - 3) A virtual circuit is established, a DTE (Data Transmission Equipment) is provided with a DLCI which it can use to communicate with the remote DTE.

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Working of frame relay

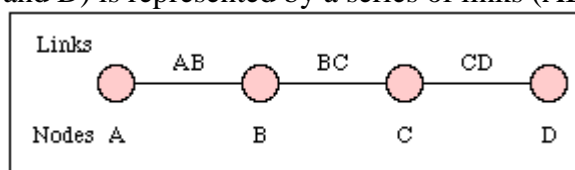
- 4) Assume that a virtual circuit has been established between computers A and C using the DLCI numbers(Fig)
- 5) Then Computer A uses DLCI=68 while sending packet from A to C and other side Computer C uses DLCI=30 while sending packet from C to A.
- 6) A frame relay uses the concept of switching in order to route packet from the sender to receiver.

b) Describe the concept of message switching with example.

(Total Marks=04, Appropriate Concept– 2 marks, diagram – 1 marks, example-1Marks)

Message Switching:

1. Message switching is a network switching technique in which data is routed in its entirety from the source node to the destination node, one hop at a time. During message routing, every intermediate switch in the network stores the whole message.
2. If the entire network's resources are engaged or the network becomes blocked, the message-switched network stores and delays the message until ample resources become available for effective transmission of the message.
3. Sometimes there is no need for a circuit be established all the way from the source to the destination. Consider a connection between the users (A and D) in the figure below (i.e. A and D) is represented by a series of links (AB, BC, and CD).



- 4.
5. A connection between two systems A & D formed from 3 links
6. For instance, when a telex (or email) message is sent from A to D, it first passes over a local connection (AB). It is then passed at some later time to C (via link BC), and from there to the destination (via link CD).
7. At each message switch, the received message is stored, and a connection is subsequently made to deliver the message to the neighboring message switch.
8. Message switching is also known as store-and-forward switching since the messages are stored at intermediate nodes en route to their destinations.

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The use of message switching to communicate between A and D

c) Define the following terms:

- i. **Numerical Aperture**
- ii. **Refraction**
- iii. **Total internal refraction**
- iv. **Acceptance angle.**

(Total Marks=04, Appropriate Each Definition = 01Mark)

i) Numerical Aperture (NA):

The numerical aperture (NA) is a measurement of the ability of an optical fiber to capture light. The NA is also used to define the acceptance cone of an optical fiber.

$$NA = n_0 \times \sin \Theta_a = (n_1^2 - n_2^2)^{\frac{1}{2}}$$

ii) Refraction:

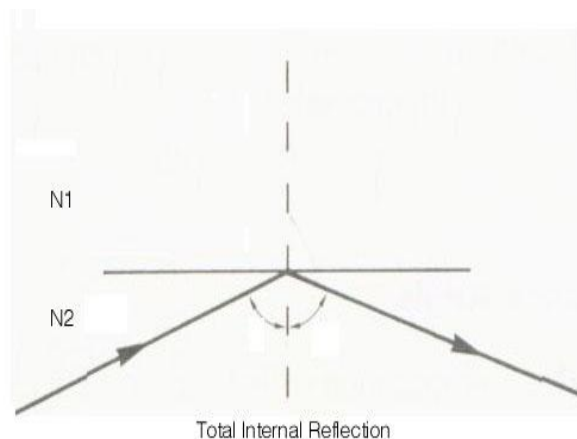
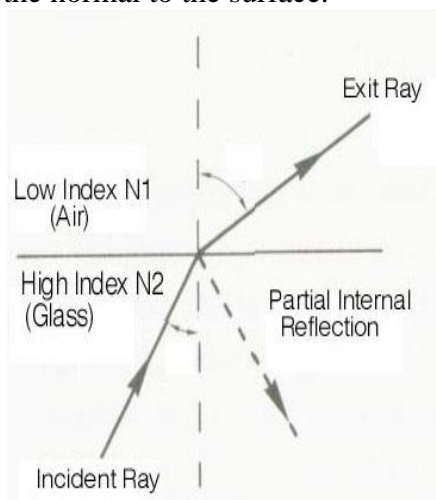
Refraction is the change in direction of a wave due to a change in its transmission medium.

Refraction is described by Snell's law, which states that for a given pair of media and a wave with a single frequency, the ratio of the sines of the angle of incidence θ_1 and angle of refraction θ_2 is equivalent to the ratio of phase velocities (v_1 / v_2) in the two media, or equivalently, to the opposite ratio of the indices of refraction (n_2 / n_1)

$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{v_1}{v_2} = \frac{n_2}{n_1}.$$

iii) Total internal reflection:

Total internal reflection is a phenomenon that happens when a propagating wave strikes a medium boundary at an angle larger than a particular critical angle with respect to the normal to the surface.



Light ray Diagram

iv) Acceptance Angle [θ_0 (max)]:

The maximum value of the incident angle θ_0 i.e. θ_0 (max) for which the incident light can propagate through the fiber to the far end is called as the acceptance angle.

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$$\sin \theta_{0\max} = n_1 \cos \phi_1' = n_1 \sqrt{1 - \sin^2 \phi_1'}$$

$$= n_1 \sqrt{1 - \frac{n_2^2}{n_1^2}} = \sqrt{n_1^2 - n_2^2}$$

Acceptance Cone:

The angle $\theta_o(\max)$ is called as acceptance angle. If we rotate the acceptance angle around the fiber axis then it forms a cone called acceptance cone.

d) List the different light sources used for fiber optic communication. Describe any one in detail.

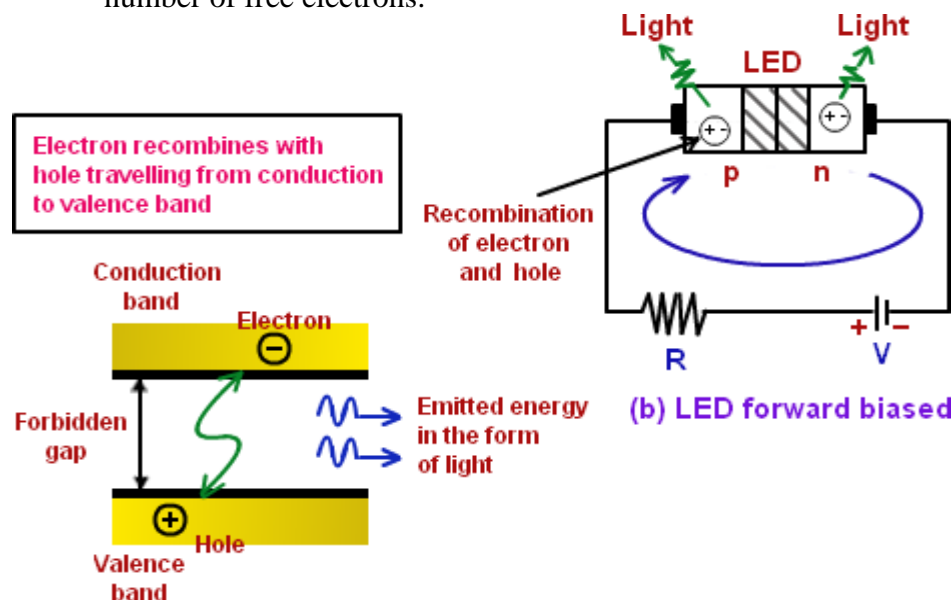
(Total Marks=04, List=1 Marks, Appropriate Description- 2 marks, diagram = 01 Marks)

Light sources fiber optics applications act as light transmitter. The different light sources used for fiber optic communication are

- 1) Light Emitting Diode (LED)
- 2) Semiconductor LASER diode.

1) **Light Emitting Diode (LED):**

- LED is a semiconductor junction diode which emits light when current is passed through it in the forward direction. It works on the principle of spontaneous emission.
- One side of Led is P-type semiconductor material which contains a large number of holes.
- The other side of the diode is N-type semiconductor material which consists of a large number of free electrons.



- When no voltage is applied across the LED, a depletion region separates the two sides. This is a region where no free charges exist. Due to the recombined holes and electrons, a barrier potential will exist across the depletion region.
- When the LED is forward biased to overcome the barrier potential, the depletion region will disappear and the holes and electrons will move freely from one side to the other.
- Due to this free movement, recombination of electrons and holes will take place.

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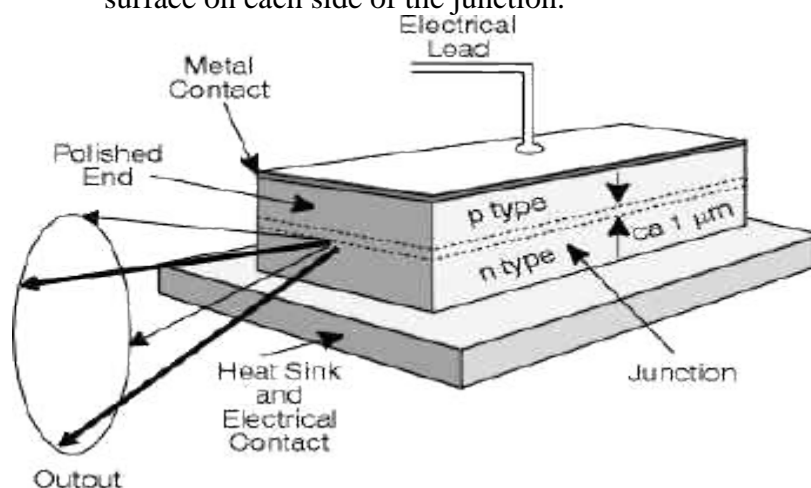
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- When an electron and hole meet and recombine, they emit “one photon” of light. The intensity of light thus depend on the number of recombination’s which in turn depends on the forward current of the LED.
- The frequency of the emitted light depends on the energy band gap of the materials used to make junction.

OR

2) Semiconductor LASER Diodes:

- LASER means light amplification by stimulated emission of radiation. Lasers can be produced by using materials like ruby, or glass like carbon dioxides.
- In fiber optic communication, semiconductor lasers are used. Semiconductor laser is a special type of laser. The laser action takes place within a semiconductor diode junction which is of the same type used for LEDs.
- The steps in generation of semiconductor laser are as follows:
 1. When current is passed through a diode junction light is emitted due to “spontaneous emission”.
 2. When a critical current level is exceeded, the population of minority carries on either sides of the junction increases. This will increase the number of recombination of electrons and holes and hence the number of photons emitted.
 3. Thus the density of photons increases to such a level that they start colliding with the already excited minority carriers. This is called stimulation of the excited minority carriers.
 4. This gives rise to the so called stimulated emission in which two photons are released instead of one. Both have the same frequency and energy level.
 5. The laser action of the semiconductor diode can be enhanced by placing a reflecting surface on each side of the junction.



e) Describe Rayleigh scattering loss and bending loss in an optical fiber cable.

(Total Marks – 4 marks)

Rayleigh scattering loss: - 2Marks

1. During the manufacturing process of glass used for the optical fiber submicroscopic variations in the density of glass takes place.
2. Also in the process of doping the impurities get frozen inside the glass and act as reflecting and refracting facets.
3. The tiny impurities will then scatter a small percentage of light passing through the optical fiber.
4. The power loss resulting due to this scattering is called as “Rayleigh scattering loss”.

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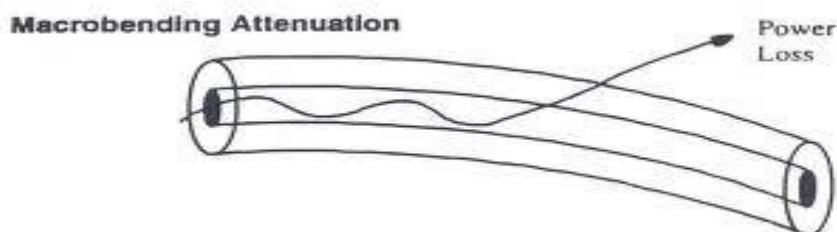
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5. It can be reduced by using improved manufacturing techniques but cannot be completely eliminated.

Bending loss: (diagram 1 mark, explanation 1marks)

1. Bending losses occurs in two forms - macrobending and microbending. When a cable is bent and it disrupts the path of the light signal. The tighter the bends of a cable, the greater it is of the light loss.



(i) Macro bends:

Macro bends describes the bending of the fiber optic cable in a tight radius. The bend curvature creates an angle that is too sharp for the light to be reflected back into the core, and some of it escapes through the fiber cladding, causing optical loss. This optical power loss increases rapidly as the radius is decreased to an inch or less. Different fiber optic cables have different specifications on how much the cable can bend without affecting the stated performance or loss. The industry has seen gradual improvements in the bending performances of the fiber. One such example is the recent G.657.B.3 fiber standard recommended by the International Telecommunication Union (ITU), where the bending radius is standardized as low as 5mm.

(ii) Micro bends:

Micro bends refer to minute but sever bends in fiber that result in light displacement and increased loss, it typically caused by pinching or squeezing the fiber. Micro bends deform the fiber's core slightly, causing light to escape at these deflections. Most micro bending can be avoided by the correct selection of materials and proper cabling, handling, and installation techniques.

Q.4.

a) Attempt any three:

a) Draw and explain architecture of BSS.

(Total Marks=04, Appropriate Explanation- 2 marks, diagram = 02 Marks)

Architecture of Basic Service Set (BSS):

1. BSS is Building Blocks of wireless LAN.
2. A basic service set is made of stationary or mobile wireless stations and an optional central base station, known as the access point(AP).
3. Basic Service Set are of two types:
 - i) BSS with AP
 - ii) BSS without AP

i) BSS with AP:

A BSS with an AP is referred to as an Infrastructure network.

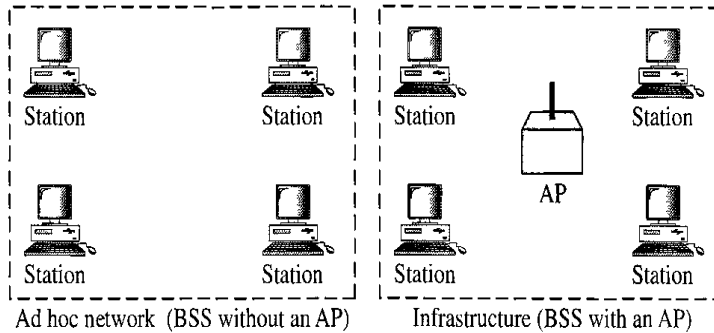
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BSS: Basic service set
AP: Access point



ii) BSS without AP:

The BSS without an AP is a stand-alone network and cannot send data to other BSSs. It is called an ad hoc architecture.

2. ESS has 2 or more access point .and Support mobility (roaming) between AP's by using mobile IP.

b) State the functions of FHSS.

(Total Marks=04, Appropriate Any Four Functions = 04 Marks)

The Functions of FHSS:

1. Frequency hopping spread spectrum is a transmission technology used in wireless networks and a technique to generate spread spectrum by hopping the carrier frequency.
2. FHSS uses narrow band signal which is less than 1 MHz, In this method data signal is modulated with a narrowband carrier signal that "hops" in random and hopping happens in pseudo-random "predictable" sequence in a regular time from frequency to frequency which is synchronized at both ends.
3. Using FHSS technology improves privacy, it is a powerful solution to avoid interference and multi path fading (distortion), it decreases narrowband interference, increases signal capacity, improve the signal to noise ratio, efficiency of bandwidth is high and difficult to intercept also this transmission can share a frequency band with many types of conventional transmissions with minimal interference.
4. For frequency hopping a mechanism must be defined to transmit data in a clear channel and to avoid the congested channels.
5. Frequency hopping is the periodic change of transmission frequency and hopping happens over a frequency bandwidth which consists of numbers of channels. Channel which is used as a hopped channel is instantaneous bandwidth while the hopping spectrum is called total hopping bandwidth.
6. Frequency hopping categorized into slow hopping and fast hopping which by slow hopping more than one data symbol is transmitted in same channel and by fast hopping frequency changes several times during one symbol.



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c) Distinguish between DCF and PCF MAC layers.
(Total Marks=04, Appropriate 4 points = 04 Marks)

NO	DISRIBUTED COORDINATION FUNCTION(DCF)	POINT COORDINATION FUNCTION(PCF)
1	DCF uses CSMA/CA as the access method.	PCF is optional access method that implemented in an infrastructure network.
2	Share the medium between stations.	APs send <i>beacon</i> frames at regular intervals.
3	Many stations attempt to communicate at the same time.	PCF defines two periods: the Contention Free Period (CFP) and the Contention Period (CP).
4	Many collisions will occur.	Collisions will not occur.
5	Lower the available bandwidth.	Higher the available bandwidth as compare with DCF.
6.	No Access Point present.	The AP is the coordinator.
7.	No Quality of Service (QoS) guarantees.	Allows for a better management of QoS.
8.	DCF is no notion of high or low priority traffic.	PCF does not define classes of traffic as is common with other QoS systems.

d) List four application of Laser.
(Total Marks=04, List and Explanation of any 4 application = 04 Marks)

Four application of Laser:

1) **Medical use of Laser:**

The highly collimated beam of a laser can be further focused to a microscopic dot of extremely high energy density. This makes it useful as a cutting and cauterizing instrument. Lasers are used for photocoagulation of the retina to halt retinal hemorrhaging and for the tacking of retinal tears.

2) **Lasers in Communication**

Fiber optic cables are a major mode of communication partly because multiple signals can be sent with high quality and low loss by light propagating along the fibers. The light signals can be modulated with the information to be sent by either light emitting diodes or lasers.

3) **Welding and Cutting**

The highly collimated beam of a laser can be further focused to a microscopic dot of extremely high energy density for welding and cutting. The automobile industry makes extensive use of carbon dioxide lasers with powers up to several kilowatts for computer controlled welding on auto assembly lines.

4) **Heat Treatment**

Heat treatments for hardening or annealing have been long practiced in metallurgy. But lasers offer some new possibilities for selective heat treatments of metal parts. For example, lasers can provide localized heat treatments such as the hardening of the surfaces of automobile camshafts.

5) **Barcode Scanners**

Supermarket scanners typically use helium-neon lasers to scan the universal barcodes to identify products. The laser beam bounces off a rotating mirror and scans the code, sending a modulated beam to a light detector and then to a computer which has the product information stored. Semiconductor lasers can also be used for this purpose.

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6) Lasers in the Garment Industry

The usefulness of the laser for such cutting operations comes from the fact that the beam is highly collimated and can be further focused to a microscopic dot of extremely high energy density for cutting.

7) Laser Printers

The laser printer has in a few years become the dominant mode of printing in offices. It employs a semiconductor laser and the xerography principle. The laser is focused and scanned across a photoactive selenium coated drum where it produces a charge pattern which mirrors the material to be printed.

b) Attempt any one:

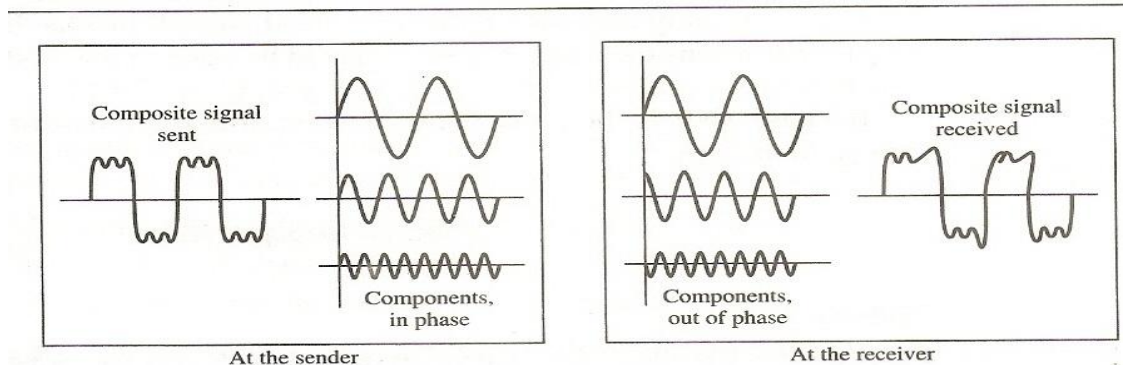
a) Explain delay distribution and attenuation errors.

(Total Marks=06,)

Delay Distortion :(diagram – 1mark, explanation – 2marks)

- Distortion means that the signal changes its form or shape. Distortion can occur in a composite signal made of different frequencies.
- Each signal components has its own propagation speed through a medium and therefore, its own delay in arriving at the final destination.
- Difference in delay may create a difference in phase if the delay is not exactly the same as the period duration.
- In other words, signal components at the receiver have phases different from what they had at the sender.
- The shape of the composite signal is therefore not the same.

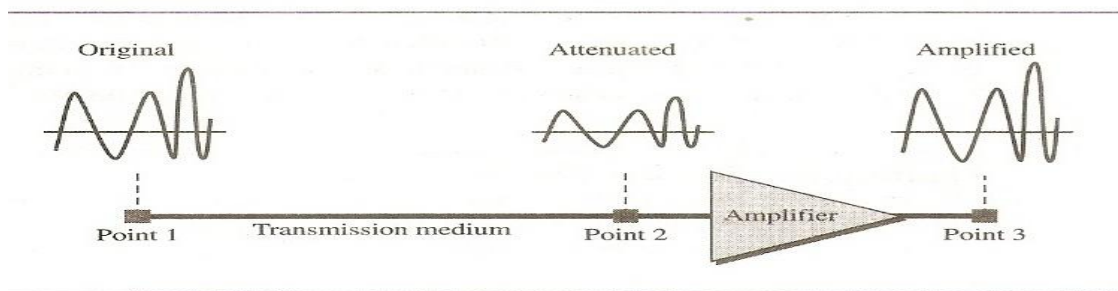
Distortion



Attenuation :(diagram – 1mark, explanation – 2 marks)

- Attenuation means a loss of energy. When a signal, simple or composite, travels through a medium, it loses some of its energy in overcoming the resistance of the medium.
- Some of the electrical energy in the signal is converted to heat.
- To compensate for this loss, amplifiers are used to amplify the signal.
- The decibel (dB) measures the relative strengths of two signals or one signal at two different points.

Attenuation



b) Describe following terms:

- i. HTTP
- ii. MIME

And mention their specific uses

(Total Marks=06)

i) HTTP: Hypertext Transfer Protocol (explanation -1 mark, diagram – 1 mark, use -1 mark)

The HTTP is a protocol used mainly to access data on the World Wide Web.

HTTP function as a combination of FTP and SMTP.

FTP transfers files and uses the services of TCP. FTP uses only one TCP connection.

HTTP is like SMTP because the data transferred between the client and server look like SMTP messages.

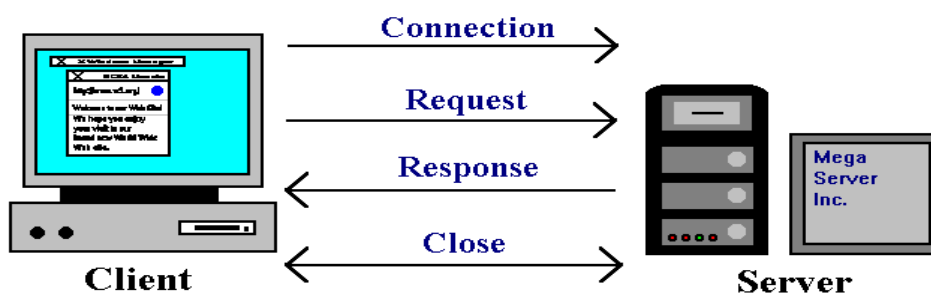
HTTP uses the services of TCP on well-known port 80.

HTTP Transaction:

HTTP transaction between the client and server. The client initializes the transaction by sending a request message. The server replies by sending a response.

Diagram:

Hypertext Transport Protocol (HTTP)



Stages in an HTTP Transaction

Specific uses of HTTP:

1. HTTP is used mainly to access data on www. This protocol transfers data in the form of plaintext, hypertext, audio, video etc.
2. The function of HTTP is like a combination of FTP and SMTP. It uses services of TCP. There is no separate control connection.

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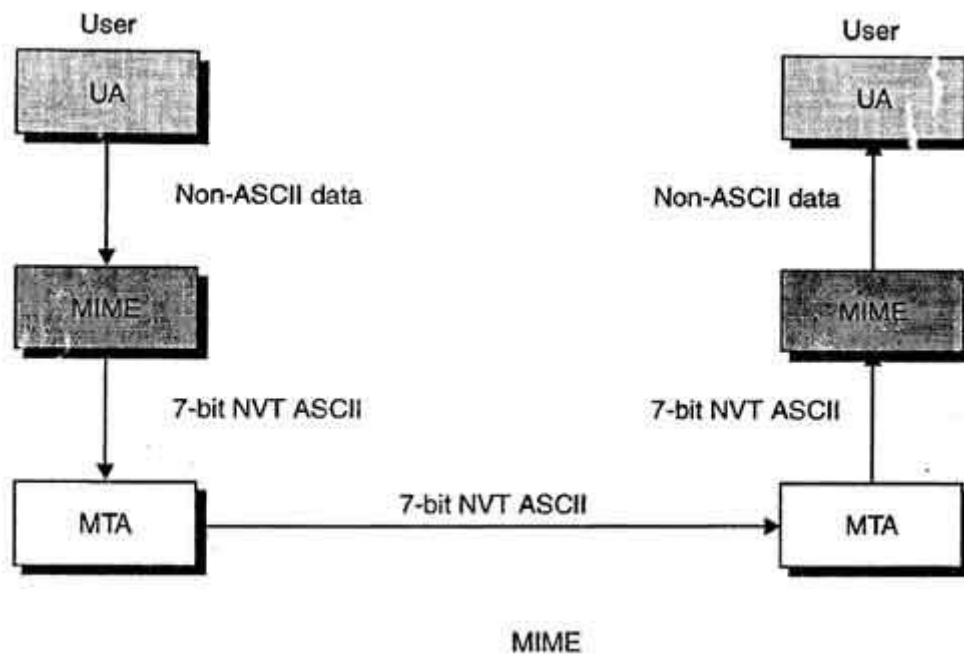
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ii) MIME: Multipurpose Internet Mail Extensions(explanation of the term – 1 mark, diagram – 1 mark, 1 use- 1mark)

MIME is a supplementary protocol that allows non-ASCII data to be sent through e-mail.

MIME transforms non-ASCII data at the sender site to NVT ASCII data and delivers them to the client MTA to be sent through the internet.

The message at the receiving side is transformed back to the original data.



Specific uses of MIME:

1. MIME is used for non ASCII message, multiple attachments in a single message, layouts, fonts and colors which are categorized as rich text.
2. MIME supports unlimited message length.

Q.5. Attempt any two:

a) Explain frame relay and frame format with example. (explain frame relay 2m, Diagram 2 marks, Description 4 marks)

Frame Relay:

- Frame relay is a WAN technology which use the virtual circuit switching.
- Frame relay operates at a higher speed (1.544Mbps tp 44.376Mbps)
- Frame relay operates in the physical and data link layers. So it can be easily used in internet.
- It has a large frame size of 9000 bytes. This can accommodate all local area network frame sizes
- Frame relay can detect errors (at the data link layer) there is no flow control or error control.
- The damaged frame is simple dropped. There is no retransmission. This is to increase the speed. So frame relay needs a reliable medium and protocols having flow and error control.
- It can handle busty data
- Lower delay



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Flag	Address	Information	FCS	Flag
1 Octet	2-4 Octets	Variable size	2 Octets	1 Octet

DLCI	C/R	EA	DLCI	FECN	BECN	DE	EA
6 bits	1 bit	1 bit	4 bits	1 bit	1 bit	1 bit	1 bit

1. **DLCI field (Address):** The first 6 bits of the first byte makes up the first part of the DLCI. The second part of the DLCI uses the first four bits of the second byte. These bits are part of the 10-bit data link connection identifier defined by the standard.
2. **Command/Responses(C/R):** The C/R bit allows the upper layers to identify a frame as either a command or response. It is not used by the frame relay protocol.
3. **Extended Address (EA):** This bit indicates whether the current byte is the final byte of the address. If EA=0 the current byte is the final one if EA=1 then another address byte is to follow.
4. **Forward explicit congestion notification (FECN):** This bit can be set by any switch to indicate that traffic is congested in the direction of travel of the frame. The destination is informed about the congestion through this bit.
5. **Backward explicit congestion notification (BECN):** This bit indicates the congestion in the direction opposite to the direction of frame traveled. This bit informs the sender that congestion has occurred. The source gets the information to slow down the packet sending to prevent loss of packet.
6. **Discard Eligibility (DE):** The DE bit indicates the priority level of the frame in the overload situation a frame may have to be discarded. If DE=1 that frame can be discarded in the event of congestion. DE bit can be set by the sender or by any switch in the network.

b) Explain the concept of URL in detail. – (8 marks description of URL)

URL (Uniform Resource Location) – 3marks

1. Name of protocol (http)
2. Name of machine where page is located
3. Name of file containing the page.

<http://www.w4.org/hypertent/www/project.html> Protocol machine name file name containing the page.

Steps between users click and page being displayed – 5 marks

1. Browser determines URL
2. Browser asks DNS for the IP address of specified machine.
3. DNS sends IP address (19.24.0.22)
4. Browser establishes a TCP connection to port 80 on machine having IP address (19.24.0.22)
5. Browser then sends a command reading GET/hyper tent/www/project.html;
6. Specified machine sends file “project.html”
7. Browser fetches and displays all images in “project.html” file
8. Browser fetches and displays all images
9. It then displays the steps that are currently being executed.
10. For each inline image such as drawing or photo, browser establishes a new TCP connection to appropriate server to fetch images.

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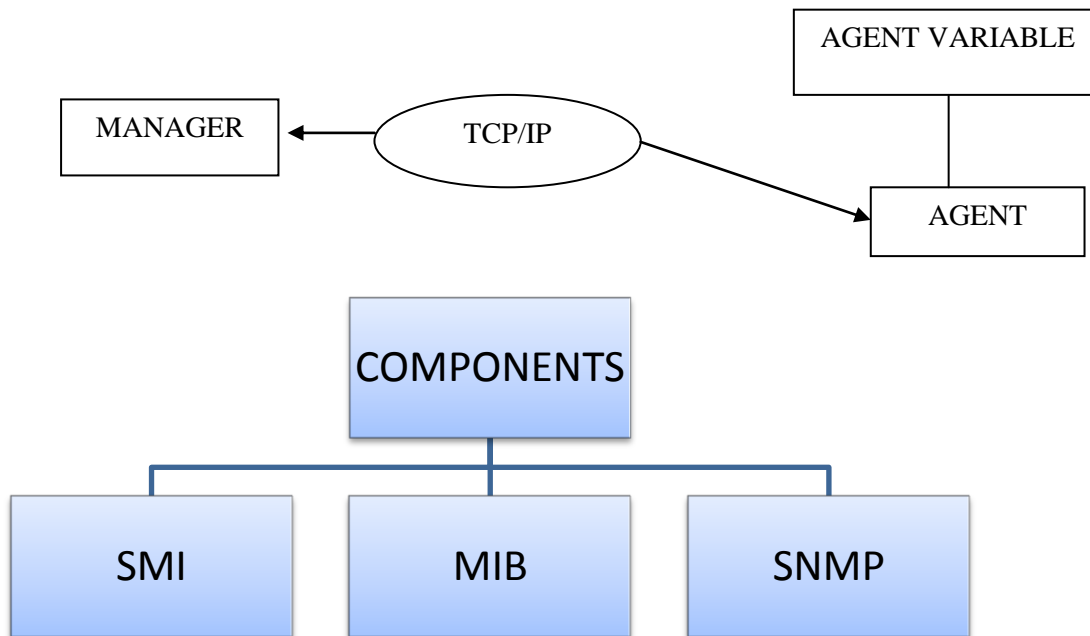
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11. HTTP is an ASCII protocol. So it is easy for person at a terminal to directly talk to web server.

- c) **Explain SNMP architecture with suitable diagram also list the components of SNMP.**
(Architecture diagram 2M, Components 2M, Description 4M)



Structure of Management Information (SMI)

The structure of management information is a standard that defines the structure syntax and characteristics of Management information in SNMP

Management Information Bases (MIBs)

- 1) Each managed device contains a set of variable that is used to manage it. This variable represents information about the operation of the device that is sent to a network management station and /or parameter sent to the managed device to control it.
- 2) The MIB is the full set of these variable that describes the management characteristics of a particular type of device.
- 3) Each variable in a MIB is called a MIB object and is define using the SMI data description language. A device may have many objects corresponding to the different hardware and software element it contains.

Simple network Management protocol(SNMP)

- 1) This is the actual SNMP protocol itself. It defines how information is exchanged between SNMP agents and network management stations.
- 2) The SNMP protocol operations define the various SNMP messages and how they are created and used.
- 3) It is simply an application program that has a client on the manager and a server on the agent. SNMP allows a manager to perform following three important tasks:

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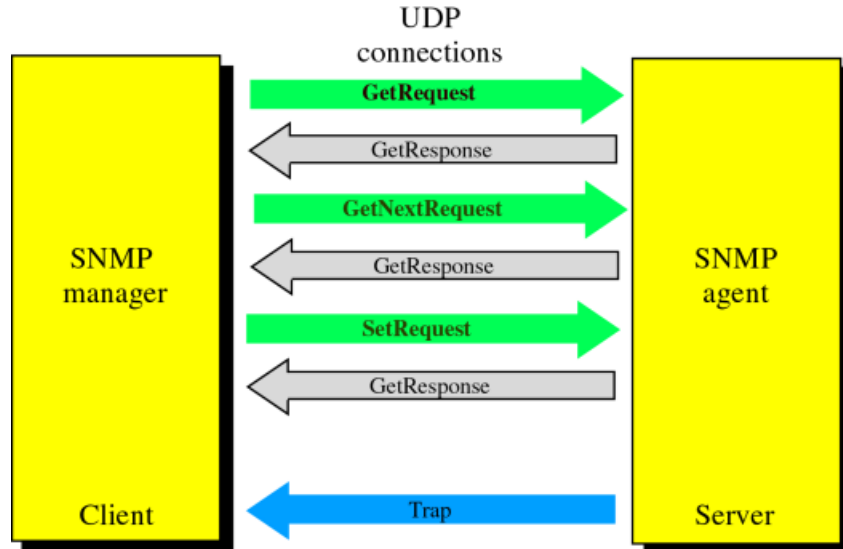
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- Retrieve any information from an agent database
- Store/update the value in an agent database.
- Receive alerts from agents in case of problems.

To achieve these objectives, **SNMP defines five message**

1) Get Request 2) GetNextRequest 3) Get Response 4) Set Request 5) Trap



Q.6. Attempt any four

a) Mention advantages and limitations of Bluetooth architecture. (2marks advantages, 2 marks limitations)

Advantages: (any 2)

- Synchronize information
- Eliminate wire
- Inexpensive
- Keep phone secure
- Facility of both data and voice communication

Limitations: (any 2)

- Relatively short range
- Security
- Interference with other devices
- compatibility

b) What is SMTP? State its importance in distributed application.(Diagram 1M, Explanation 3M)

SMTP is simple Mail transfer protocol. The functions of SMTP are

- Most popular network service is e-mail
- Sending a single message to one or more recipients.
- Sending messages that include text, voice, video, graphics etc...
- Sending messages to users on network outside the internet.

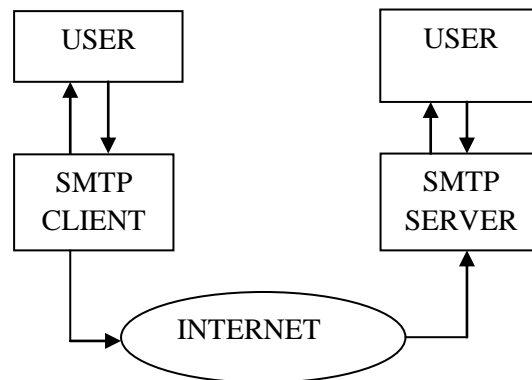


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Components of SMTP system

Both SMTP server and client have two components

- User Agent (UA)
- Mail Transfer Agent (MTA)

Functions of UA and MTA

- The UA prepares the message, creates the envelope, & puts the envelope in the envelope.
- The MTA transfers the mail across the internet.

SMTP works in following 3 stages

1. Connection Establishment:
2. Message Transfer (Mail Transfer)
3. Connection Termination

Connection Establishment: The TCP connection is made on port no 25. SMTP server starts the connection phase This phase include following three steps which are

The server tells the client that is ready to receive the mail by using the code 220.If the server is not ready, it sends code 421 which tells that service is not available.

Once the server becomes ready to receive the mail , client sends the HELLO message to identify itself using the domain name address .This important step which inform the server of the domain name of the client.

TCP connection establishment the sender and receiver know each other through their IP addresses. Server responses with code 250 which tells that request command is completed.

Message Transfer (Mail Transfer): Once the connection has been established SMTP server send message to SMTP receiver. The messages are transfer in three stages

A 'MAIL' command identifies the message originator.

RCPT (recipients) command identifies the receiver of the message.

DATA command transfers the message text.

Connection Termination: After the messages transfer successfully, the client terminates the connection The connection is terminated in 2 steps.

The client sends the 'QUIT' command

The server responds with code 221 or some other appropriate code.

After the termination phase the TCP connection must be closed. SMTP importance in distributed applications:

SMTP is relatively simple, text based protocol in which one or more recipient of a message are specified along with the message text and possibly other encoded objects.



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Easy to implement and higher speed.

c) Explain the characteristics of data communication system. (1 mark each)

The effectiveness of any data communications system depends upon the following four fundamental characteristics:

1. **Delivery:** The data should be delivered to the correct destination and correct user.
2. **Accuracy:** The communication system should deliver the data accurately, without introducing any errors. The data may get corrupted during transmission affecting the accuracy of the delivered data.
3. **Timeliness:** Audio and Video data has to be delivered in a timely manner without any delay; such a data delivery is called real time transmission of data.
4. **Jitter:** It is the variation in the packet arrival time. Uneven Jitter may affect the timeliness of data being transmitted.

**d) Differentiate between analog and digital signal. Also define bandwidth of a signal.
(2 differences – 2marks, definition of bandwidth – 2marks)**

Sr. NO.	Parameter	Analog Signals	Digital Signals
1	Number of value	Infinite	Finite(2,8,16 etc)
2	Nature	Continuous	Discrete
3	Source	Signal generators, transducers etc.	Computers, A to D converters
4	Examples	Sine wave, triangular wave	Binary signal

Bandwidth of a signal can be defined as the frequency range over which an information signal is transmitted. It is the portion of the electromagnetic spectrum occupied by a signal it is the difference between the upper and lower limits of the signal.

$$BW=f_{\max}-f_{\min}$$

f_{\max} =maximum frequency present in the signal

f_{\min} =minimum frequency present in the signal.

e) State advantages and disadvantages of network standards.

Advantages: (2 advantages – 2marks)

1. They create and maintain an open and competitive market for manufactures.
2. They guarantee national and international interoperability of data and telecommunication technology and processes.
3. They provide guidelines to manufacturers.

Disadvantages: (2 disadvantages -2 marks)

1. The De-facto standards which are not approved by any organizational body cannot be used over a wide geographical area.
2. For smaller manufacturers or vendors, it becomes difficult to manufacture the products as per the standards that have been approved by the international approving bodies.