



SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

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 SIX of the following:

MARKS 12

i) What is MAC address? Write the instruction to find MAC address.

(MAC address 1mark, instruction 1mark)

MAC (Media access control address)

MAC address is a unique id associated with the network adapter (NIC) and it uniquely identifies an adapter on a LAN or internet

Instruction to find address in windows Vista, NT 2000, 2003 or XP:-

- 1) open command prompt & give instruction
ipconfig /all

ii) List the advantages of computer Hardware.

(Note: Also consider advantages of computer networks)

(Any 4 Advantages, 1/2 mark each)

Advantages of computer hardware:

- Data transfer
- Data storage
- Input data through input devices
- Network connecting and control devices
- Devices used for output
- Processor



SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

OR

Advantages of computer network:

- 1) Fast sharing and data transfer of files
- 2) Reduced cost
- 3) Improved security
- 4) Centralized software management
- 5) E-mail
- 6) Flexible access

iii) What are various network control devices?

(Listing of any 4 control devices ½ mark each)

- Repeater
- Hub
- Switch
- Bridge
- Router
- Gateway
- Modem

iv) What is IP address? State the IP address classes.

(Definition of IP address 1 mark, List of IP address classes 1 mark)

IP (internet protocol address):-

IP address is a logical address, 32 bit address having netid & hostid that uniquely & universally identified over TCP/IP network or local network or to internet. Messages are routed in a TCP/IP network based on destination IP address.

IP address classes:- Class A, Class B, Class C, Class D, Class E



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

v) What is Hub? Give the different types of Hubs.

(Definition of hub 1mark, list types of hubs 1mark)

Hub is amplifying & splitting device .Hub contains multiple ports & is a common connection point for connecting all segments of a LAN.When a packet arrives on a port, it is forwarded to rest of ports so that it can be sent to all other nodes in the network.

Types of Hub:-

- 1) Active Hub
- 2) Passive Hub
- 3) Intelligent hub

vi) State the names of 2 sub layers of Data Link Layer.

(List of 2 sub layers 1 mark each)

- a) MAC (Media access control)
- b) LLC (Logical link control)

vii) Why the n/w cable is twisted?

(2 marks for reason specified)

If wires are kept in parallel, signal may have crosstalk effect to avoid it wires are twisted. It may results in greater level of noise.

viii) State four advantages of Bus topology.

(Any 4 advantages ½ mark for each advantage)

- 1) Easy to install & setup
- 2) Less cabling is required compared to mesh or star topology.
- 3) It is cheaper
- 4) Suitable for small networks.



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

b) Attempt any **TWO** of the following:

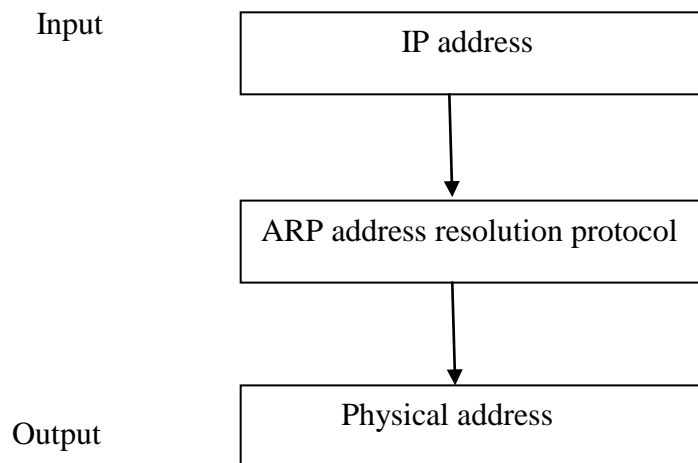
MARKS 8

i) What is ARP? What are the functions of ARP?

(ARP purpose 1 mark, functions of ARP 3 marks)

ARP(Address resolution protocol):-

Address resolution: Process for obtaining physical address of a computer based on its IP in order to transfer data over the network to which the node belongs to. Network hardware needs datagram to contain physical address of receiver. ARP takes IP address of host as input & gives its corresponding physical address as output.



3 methods for getting physical address based on IP address:

- 1) **Table lookup** : Mapping information between IP address & physical address is stored in a table in memory. ARP software uses this table to find out physical address.
- 2) **Closed form computation**: By using algorithm, IP address can be transformed into physical address by performing arithmetic & Boolean operations.
- 3) **Message exchange**: It is very popular method. ARP request is broadcasted to all computers on network. The host on network that has IP address in the request then replies with its physical address.

ARP Caching :- Once physical address of corresponding IP address is known, it stores this information in a table. This is called as ARP Caching. Next time if host wants to send data to

SUMMER – 13 EXAMINATION

Model Answer

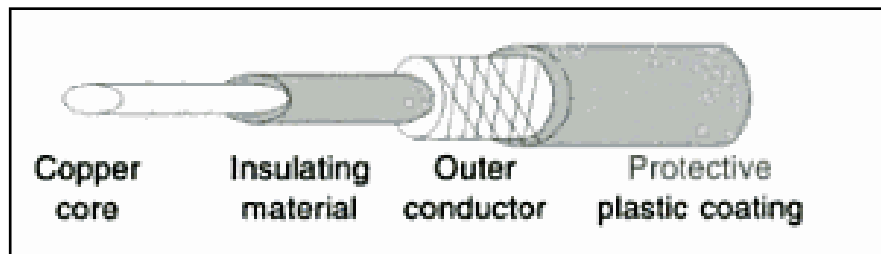
Subject Code: 12110

Subject Name: **Computer Networks**

same host, ARP request need not be broadcasted. Instead first it checks in ARP cache. Only if IP address is not found in ARP cache, It broadcasts ARP query datagram.

ii) Draw and explain Co-axial cable.

(Diagram 2 marks, explanation 2 marks)



Co-axial cable

Co-axial cable as inner central conductor surrounded by an insulating sheath which in turn is enclosed in a outer conductor (Shield). This acts not only as a second conductor for completing the circuit but also acts as shield against noise. Outer conductor is covered by Plastic covering .Co-axial cable is also called as coax and is more expensive than UTP, STP , less flexible and more difficult to install in building where number of twists and turns are needed. It is reliable & can carry higher data rates. Various categories of Co-axial cable are available dependent on thickness & size of shield, insulator and outer coating. Co-axial cable standards are RG(radio government) 59,RG 58,RG11,etc.

iii) What is NIC? State 3 functions of NIC.

(NIC 1 mark, any 3 functions 3 marks)

NIC(Network interface card / network adapter):

It physically makes the connection, works as interface between computer and network cable.

Functions of NIC:

- 1) Provide physical link or connectivity between computer and the network physical medium.
- 2) Prepare data from computer for network cable.
- 3) Send data to another node in network.
- 4) Control flow of data between computer and physical medium



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

- 5) Receive incoming data from cable and translate it into bytes that can be understood by computer.

Q.2.a) Attempt any THREE of the following:

MARKS 12

- i) **Compare Broadband transmission and baseband transmission.**

(Any 4 points 1 mark each)

Baseband Transmission	Broadband transmission
It uses digital signaling over single wire	It uses analog signals over multiple transmission frequencies.
It is bi directional communication i.e. it allows computer to send and receive data using single cable but sending and receiving can't be done on same wire at same time.	Multiple channels or created in broadband by using frequency division multiplexing (FDM).
Multiple signals on single cable can be transmitted on single wire using multiplexing	Multiple channels or created in broadband by using frequency division multiplexing (FDM).



SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

TDM(Time division Multiplexing) is used in Baseband	FDM is used in Broad band
TDM Divides single channel into multiple time slots	FDM allows baseband media to allow data to flow in different directions on single medium at same time
Digital signal used in base band transmission occupies entire band width of network medium to transmit a single signal	Transmission system is allocated apart of total bandwidth
E.g. 10 Base T, 100 base T, 10 Base 5, 10 base2	E.g. 10 Broad 36

ii) Define the following terms:

(Each point: 1 mark)

- 1) **Ethernet:-**It uses star or bus topology and supports for data rate of 10 Mbps to 1 Gbps . Ethernet Specification served as basis for IEEE 802.3 standard. Ex. Fast Ethernet 100 Base T(data transfer rate 100 Mbps) , Gigabit Ethernet (data transfer rate 1 Gbps)
- 2) **Protocol: -** it is set of rules and conventions .Sender and receiver in data communication must agree on common set of rules before they can communicate with each other. Protocol defines.
 - a) Syntax (what is to be communicated)
 - b) Semantics (how is it to be communicated)
 - c) Timing (When it should be communicated)



SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

- 3) **Topology:-** topology refers to the way a network is laid out either physically &/ logically
OR network topology defines how various computers or nodes are connected to one another

OR

Topology refers to the way in which a network is laid out physically. Two or more devices connect to a link, two or more links from a topology.

OR

Topology of a network is geometric representation of relationship of all links & linking devices i.e. node to one another.

- 4) **File server:** - It is a computer & storage device dedicated to store files. Any user on network can store files on server.

OR

A high speed computer in network that stores programs, data files shared by users. File server stores programs and data.

iii) Explain N/w features.

(Any 4 features: 1 mark each)

- 1) **File sharing :-** files can be centrally stored and used by multiple users. Shared directory or disk drive is used. If many users access same file on network and make changes at same time and conflict occurs. Network operating system performs file sharing and provides security to share files.
- 2) **Printer sharing:** Printer connected in a network can be shared in many ways . Use printer queues on server. Here printer is connected to server. Each work station can access printer directly. Printer can be connected to server. Connect a printer to a computer in a network and run special print server software. Use built in print server. Use dedicated print server. By printer sharing reduces no. of printers needed.
Share costly and high quality printers.
- 3) **Application services:** Share application on a network. When applications are centralized, amount of memory required on disk of work station is reduced. It is easier to administer an application. It is more secure and reliable. It is faster and convenient.



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

4) **E-mail services.** Two types of email systems are available:

1) File based system: Files are stored in shared location on server. Server provides access to file. Gate way server connects from file based email system to internet.

2) Client server e-mail system: E-mail server contains message and handles e-mail interconnections.

e-mail client functions(also consider other e-mail functions): read mail, send, compose, forward, delete.

E-mail protocols: SMTP, POP etc.

5) **Remote access:** Set up remote access service on network operating system. Setup VPN(virtual private network) on internet terminal services(TELNET).

User can access files from remote location .

User can access centralized application or share files on LAN.

iv) **What is subnetmasking? Design the subnets, to find six subnet addresses for the site address 201.70.64.0.**

(Definition of subnet masking 1 mark, solved any 6 subnet ids 3 marks)

Subnet masking: mask is used to determine what subnet an Ip address belongs to that is it decides the class of an IP address it is used to identify network address and host address in an IP address . Subnet mask is made by setting network bits to all 1's and setting host bits to all 0's.

Given site address: 201.70.64.0.

201 70 64 0

11001001	01000110	01000000	00000000
----------	----------	----------	----------

It is class C network 201.70.64.0.

For finding 6 subnet addresses atleast 3 subnet bits are used.

Subnet 1 : 11001001. 01000110. 01000000.00000000

Subnet id 1: 201.70.64.0

Subnet 2: 11001001. 01000110. 01000000.00100000

Subnet id 2: 201.70.64.32



SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

Subnet 3: 11001001. 01000110. 01000000.01000000

Subnet id 3: 201.70.64.64

Subnet 4: 11001001. 01000110. 01000000.01100000

Subnet id 4: 201.70.64.96

Subnet 5: 11001001. 01000110. 01000000.10000000

Subnet id 5: 201.70.64.128

Subnet 6: 11001001. 01000110. 01000000.10100000

Subnet id 6: 201.70.64.160

Subnet 7: 11001001. 01000110. 01000000.11000000

Subnet id 7: 201.70.64.192

Subnet 8: 11001001. 01000110. 01000000.11100000

Subnet id 8: 201.70.64.224

b) Attempt any ONE of the following:

MARKS 4

i) If you have only two computers to connect to a network which type of cable is used? Name the type of the cable and state the pin assignment used at both the ends of cable connector.

(Name of cable 1 mark, type of cable 1 mark, pin assignment 2 marks)

If only two computers are to be connected in a network then UTP cross over cable is used,

Pin assignment at both ends of cable connectors:

Twisted pair cable with send and receive pairs of wires crossed. Cross over cable is used to establish a two station LAN.

Pin diagram of cross over connection:

Green white	1	_____	3	Orange white
Green	2	_____	6	Orange
Orange white	3	_____	1	Green white
Blue	4	_____	5	Blue white
Blue white	5	_____	4	Blue
Orange	6	_____	2	Green
Brown white	7	_____	8	Brown
Brown	8	_____	7	Brown white



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

ii) Describe the seven layers of OSI model.

(list of all seven layer 1 mark, brief description of each layer 3 marks)

OSI model is a layered frame work for the design of network systems that allows for communication across all types of computer systems.

- 1) **Physical layer:** It co-ordinates the functions required to transmit bit stream over physical medium. It deals with mechanical and electrical specifications of interface and transmission medium. For transmission it defines procedures and functions that devices and transmission medium has to perform.

- Physical characteristics of interfaces and media.
- Representation of bits: Data rate(transmission rate).
- Synchronization of bits.
- Line configuration: Point to point or multipoint configuration should be used.

2) Data link layer:

It is responsible for transmitting group of bits between the adjacent nodes. The group of bits is called as frame. The network layer passes a data unit to the data link layer. Header and trailer is added to the data unit by data link layer. This data unit is passed to the physical layer.

Data link layer is responsible for moving frames from one node to the next.

Functions of data link layer are:

- 1) Framing
- 2) Physical addressing
- 3) Flow control
- 4) Error control
- 5) Media access control
- 6) Node to node delivery

3) Network layer:

It is responsible for routing the packets within the subnet i.e. from source to destination. It is responsible for source to destination delivery of individual packets across multiple networks. It ensures that packet is delivered from point of origin to destination.



SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

Functions of network layer:

- 1) logical addressing
- 2) Routing.
- 3) Congestion control
- 4) Accounting and billing
- 5) Address transformation
- 6) Source host to destination host error free delivery of packet.

4) Transport layer:

Responsibility of process to process delivery of message

Ensure that whole message arrives in order.

- 1) Service point addressing
- 2) Segmentation and reassembly
- 3) Connection control
- 4) Flow control: Flow control is performed end to end
- 5) Error control

5) Session layer:

Establishes, maintains, synchronizes the interaction among communication systems

It is responsible for dialog control and synchronization

- 1) Dialog control
- 2) Synchronization, session and sub session
- 3) Session closure

6) Presentation layer: It is concerned with syntax , semantics of information exchanged between the two systems.

Functions: Translation, encryption, compression

7) Application layer: It enables user to access the network. It provides user interfaces and support for services like email, remote file access.

Functions: network virtual terminal, file transfer access and management, mail services and directory services



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

Q.3. a) Attempt any ONE of the following:

MARKS 4

i) Write the names of the layers that performs the following functions in OSI.

(1 mark each point)

- 1) Data Encryption : Presentation layer
- 2) Error Correction : Data link layer & Transport layer
- 3) File transfer : Application layer
- 4) Data Encoding : Presentation layer

ii) State the layers at which the following protocols works:

(1 mark each point)

- 1) ARP : Network layer
- 2) PPP : Data link layer
- 3) SMTP : Application layer
- 4) ICMP : Network layer

b) Attempt any THREE of the following:

MARKS 12

i) Describe of the following terms w.r.t. the cellular telephony.

(1 mark each point)

1) Soft hand off:

Is a process of transferring an ongoing call from one channel to another without the loss of service. Soft hand off refers to a feature used by the CDMA and W-CDMA standards, where a cell phone is simultaneously connected to two or more cells during a call.

2) Roaming:

Roaming is a general term referring to the extension of connectivity service in a location that is different from the home location where the service was registered. Roaming ensures that the wireless device is kept connected to the network, without losing the connection.

The term "roaming" originates from the GSM Global System for Mobile Communications as the ability for a cellular customer to automatically make and receive voice calls, send and receive data, or access other services, including home data services, when travelling outside the geographical coverage area of the home network. In roaming vlr visitors location register is utilized.



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

3) AMPS:

Advanced Mobile Phone Service (AMPS) is a standard system for analog signal cellular telephone service in the United States and is also used in other countries. It is based on the initial electromagnetic radiation spectrum allocation for cellular service by the Federal Communications Commission

AMPS allocates frequency ranges within the 800 and 900 Megahertz (MHz) spectrum to cellular telephone. Each service provider can use half of the 824-849 MHz range for receiving signals from cellular phones and half the 869-894 MHz range for transmitting to cellular phones.

The analog service of AMPS has been updated with digital cellular service

4) GSM:

Global System for Mobile Communications, is a standard set developed by the European Telecommunications Standards Institute to describe protocols for second generation (2G) digital cellular networks used by mobile phones. It became the de facto global standard for mobile communications e.

The GSM standard was developed as a replacement for first generation (1G) analog cellular networks, and originally described a digital, circuit switched network optimized for full duplex voice telephony. This was expanded over time to include data communications, first by circuit switched transport, then packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM Evolution or EGPRS). "GSM" is a trademark owned by the GSM Association

ii) Explain the services provided by Data link layer in OSI Model.

(Explanation of any four services: 1 mark each)

The data link layer is the protocol layer that transfers data between adjacent network nodes in a wide area network or between nodes on the same local area network segment. The data link layer provides the functional and procedural means to transfer data between network entities and might provide the means to detect error ask to transmitter to retransmit the data if required for correction

The data link layer is concerned with local delivery of frames between devices on the same LAN.

When devices attempt to use a medium simultaneously, frame collisions occur. Data-link protocols specify how devices detect and recover from such collisions, and may provide mechanisms to reduce or prevent them



SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

Specific Services provided by data link layer :

Framing: Adding headers & trailers to the packet received from network layer & convert it in frame.

Addressing : Source MAC Address & destination MAC address is added with frame which can guide to the frame for forwarding the frame one node to another

Flow control: Ensures about the synchronization of transmitting & receiving system which results in transmission of data without any loss

Error control: under data link layer error detection is done on parity check basis & as far as correction is concern receiving system will request sender system to resend once again.

Media access control: the media which are in share is controlled by applying media access control methods such as CSMA/CD OR TOKEN RING
TOKEN PASSING etc.

iii) Explain the operation of modem.

(Diagram: 2 marks, explanation 2 marks)

Modem is an interconnectivity device used to connect our home pc to the internet .it has both the operation modulation & demodulation hence the name.

As far as infrastructure for communication is concern it is an analog type & the data from computer is in digital format, which can not be transferred as it is, for which modem can be utilized .

Modem receive data from computer converts in analog format which can be transmitted through transmission media to a certain distance & can be reconverted back to digital format by modem & feeded to computer thus modem does the operation of D/A conversion & A/D conversion.

SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

DETAILED OPERATION of a MODEM can be understood by referring following diagram.

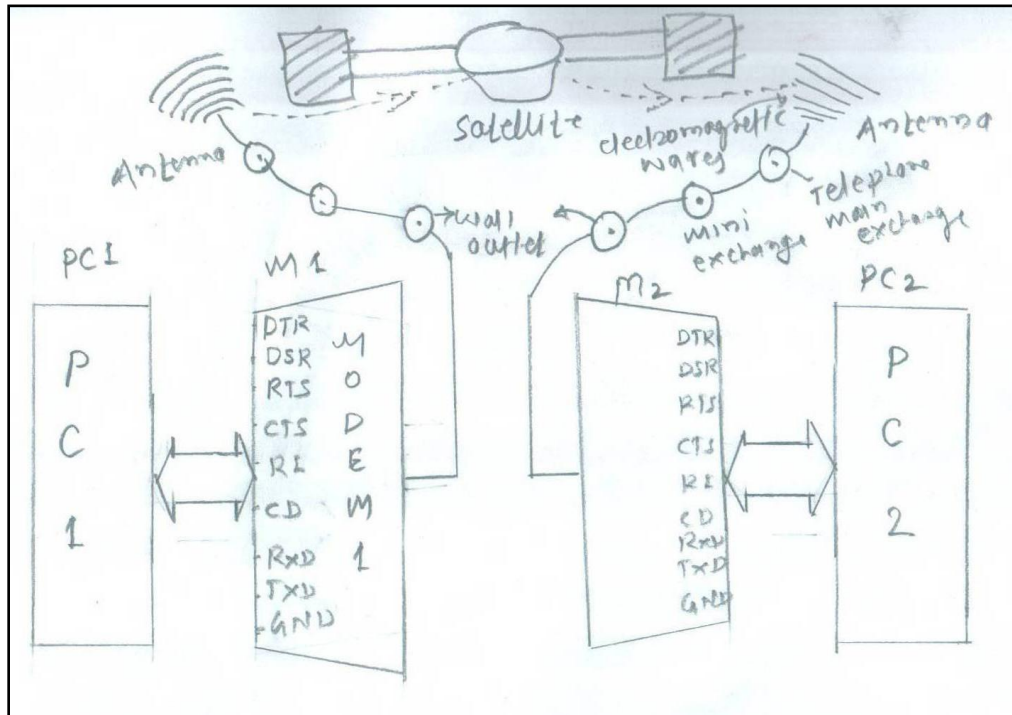


Fig. : Working Principle of MODEM

By referring the diagram we can understand that how the modem 1 & modem 2 cooperate with computer system to transfer the given data from one network to another network .

By referring above diagram we will see that how computer 1 & computer 2 will communicate each other by using modem 1 & modem2.

Consider pc 1 would like to communicate with pc 2 , pc1 will send a signal called as DTR (DATA TERMINAL READY) to its MODEM 1 , in reply MODEM 1 will send a signal called as DSR (DATA SET READY) to pc1 thus pc1 & modem 1 both are ready for communication. Now for communication pc1 will send a request signal to modem 1 in the form of a signal called as RTS(REQUEST TO SEND) along with ADDRESS of pc2 to modem 1 , modem 1 will search the entire path , will see that modem 2 is free or not & pc2 is ready or not.



SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

If pc2 is ready & modem 2 is ready & entire path is free then modem 1 will send CTS signal to pc1 indicating green signal for transferring data.

After the CTS signal received by pc1 from modem1, pc1 will send the data to pc2 through the signal called as TXD (transmit data), transmitted data will reach at modem 2, now modem 2 will indicate to pc2 about the data from pc1 through RI (RING INDICATOR) SIGNAL & thus modem 2 will request to pc2 that pc2 should be ready to receive the data from pc1 just arrived at modem2. Pc2 will receive the data through RXD (RECEIVE DATA) Signal.

Thus data transmitted from pc1 is reached to pc2 indicates that communication takes place between pc1 & pc2 with the help of modem1 & modem2.

iv) Identify the topology in figure given below. Explain advantages and disadvantages of topology given in Fig No.1

(Identification of topology : 2 marks, any 2 advantage : 1 mark, any 2 disadvantage : 1 mark)

Given diagram indicates Star topology

Advantages:

- 1 highly reliable
- 2 adding new node is very easy
- 3 failure of any node does not affect the network
- 4 troubleshooting is very easy

Disadvantages:

- 1 cost is very high
- 2 central hub/switch fails entire network collapse

SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

Q.4 Attempt any TWO of the following:

MARKS 16

a) With the help of diagram explain satellite communication.

(Diagram: 2 marks, explanation: 4 marks, frequency band: 1 mark, application: 1 mark)

SATELLITE COMMUNICATION :

In satellite communication, signal transferring between the sender and receiver is done with the help of satellite. In this process, the signal which is basically a beam of modulated microwaves is sent towards the satellite called UPLINK (6 Ghz). Then the satellite amplifies the signal and sent it back to the receiver's antenna present on the earth's surface called as DOWNLINK (4Ghz), as shown in the diagram given below.

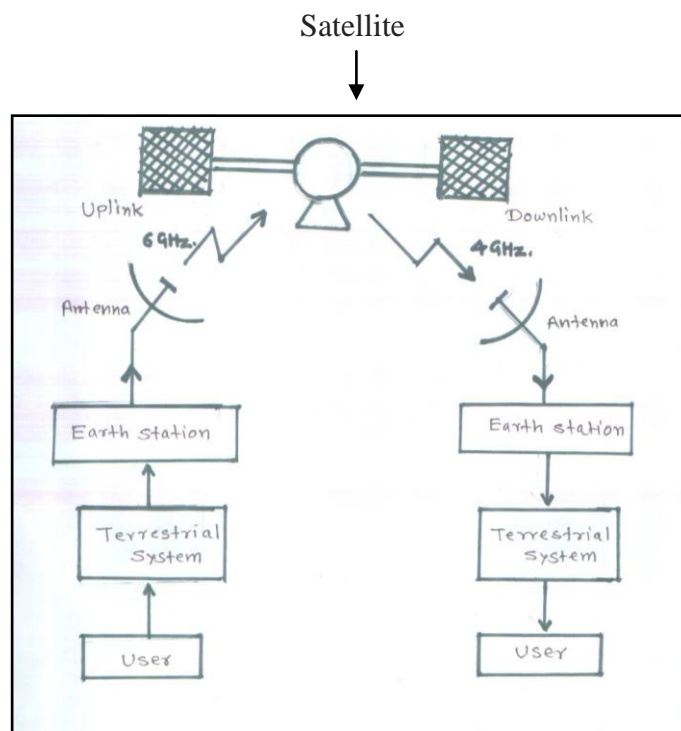


Fig : Satellite Communication



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

As the entire signal transferring is happening in space. Thus this type of communication is known as space communication. In the diagram given below has uplink frequency of about 6 GHz. & downlink frequency of 4 GHz. That is satellite receive microwave signal at 6 GHz frequency amplifies & down convert it to 4 GHz & transmit it back to earth station to avoid collision

Two satellites which are commonly used in satellite communication are Active and passive satellites.

Passive satellites: It is just a plastic balloon having a metal coated over it. This sphere reflects the coming microwave signals coming from one part of the earth to other part. This is also known as passive sphere. Our earth also has a passive satellite i.e. moon.

Active satellites: It basically does the work of amplifying the microwave signals coming. In active satellites an antenna system, transmitter, power supply and a receiver is used. These satellites are also called as transponders. The transmitters fitted on the earth generate the microwaves. These rays are received by the transponders attached to the satellite. Then after amplifying, these signals are transmitted back to earth. This sending can be done at the same time or after some delay. These amplified signals are stored in the memory of the satellites, when earth properly faces the satellite. Then the satellite starts sending the signals to earth.

Geostationary or Geosynchronous satellite : is specifically used for low cost Communication, which is placed at an altitude of 36,000 KM from the earth

Frequency band used in satellite communication :

Band	Downlink	Uplink
C	3.7 to 4.2 GHz	5.925 to 6.425GHz
Ku	11.7 to 12.2 GHz	14 to 14.5 GHz
Ka	17.7 to 21 GHz	27.5 to 31 GHz

SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

Application of satellite:

- *Satellite television
- *digital cinema
- *satellite radio
- *satellite internet access

b) Draw the neat sketch of fiber optic cable. Give the transmission characteristics of Fiber optic cable. State its applications

(Diagram: 3 marks, transmission characteristics: 3 marks, application: 2 marks)

Structure of FIBER OPTIC CABLE:

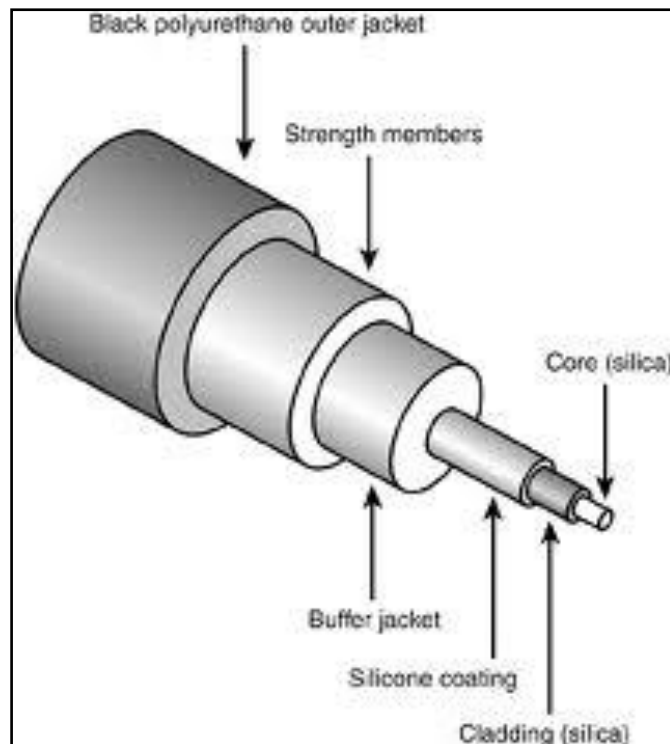


Fig: Structure of fiber optic cable:



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

Transmission Characteristics:

1. Low Attenuation: Carry signal to a longer a distance
2. No EMI: No effect of External environmental condition
3. High Band width up to 2 GBPS
4. Noise resistance: Uses light signal rather than electricity
5. Higher data transfer rate

APPLICATION :

- Widely used in network (WAN /MAN /Internet etc.)
- Telephone system
- Replacement of satellite for interconnecting countries together through sea media

c) Compare Ring, Bus and Star Topology.

(Any 8 points: 1 mark each)

	Star	Bus	Ring
1. Configuration	Easy	Moderate	Difficult
2. Troubleshooting	Very Easy	Difficult	More Difficult
3. Media Failure	Does not affect entire N/W	Entire N/W collapse	Entire network collapse
4. Failure of Node	Does not affect	Partially affected	Entire N/W Collapse
5. Addition of a node	Easily added even the N/W is under working condition	Bit difficult as entire N/W has to shut down and then a node can be added	Very difficult as entire N/W has to shutdown and then node can be added and entire N/W has to reconfigure



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

6.	Cables and connectors used	RJ 45 Connectors, UTP Cable	T- Connector, BNC Connector, Terminator, Co-axial cable	T-Connector, BNC connector, Co-axial Cable OR Fiber optic connector and fiber optic cable
7.	Lan card used	ARCnet	Ethernet	Ethernet OR Fiber Optic Card
8.	Interconnectivity device used	Hub/ Switch	Not applicable	Not applicable
9.	Reliability	Highly reliable`	Lower	Moderate

Q.5 Attempt any FOUR of the following:

MARKS 16

a) Explain the following terms:

i) PPP

(Explanation-2 marks)

PPP means *Point to Point Protocol*. It is a much more developed protocol than SLIP (which is why it is replacing it), insofar as it transfers additional data, better suited to data transmission over the Internet (the addition of data in a frame is mainly due to the increase in bandwidth).

In reality, PPP is a collection of three protocols:

- a datagram encapsulation protocol
- an **LCP**, Link Control Protocol, enabling testing and communication configuration
- a collection of **NCPs**, Network Control Protocols allowing integration control of PPP within the protocols of the upper layers

Data encapsulated in a PPP frame is called a *packet*. These packets are generally datagrams, but can also be different (hence the specific designation of *packet* instead of datagram). So, one field of the frame is reserved for the type of protocol to which the packet belongs. A PPP frame looks like this:



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

Data to be transmitted	Padding data
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The padding data is used to adapt the length of the frame for certain protocols.

ii) SLIP

(*Explanation-2 marks*)

SLIP means *Serial Line Internet Protocol*. SLIP is the result of the integration of modem protocols prior to the [suite of TCP/IP protocols](#).

It is a simple Internet link protocol conducting neither address or error control, this is the reason that it is quickly becoming obsolete in comparison to PPP.

Data transmission with SLIP is very simple: this protocol sends a frame composed only of data to be sent followed by an end of transmission character (the *END* character, the [ASCII code](#) of which is 192). A SLIP frame looks like this:

Data to be transmitted	END
-------------------------------	------------

b) Compare client server and peer to peer network.

(*Any four points, 1 mark each*)

Comparing Client/Server and Peer-to-Peer Networking		
Item	Client/Server	Peer-to-Peer
Access control	Via user/group lists of permissions Via user/group lists of permissions to only the resources granted, and different users can be given different levels of access.	Resources are managed by each system with shared resources. Depending on the OS, resources may be controlled by separate passwords for each shared resource or by a user list stored on each system with shared resources. Some OSs do not use passwords or user/group lists, thus enabling access to shared resources for anyone accessing the network.
Security	High; access is controlled by user or by group identity.	Varies; if password protection is employed, anyone who knows the password can access a shared resource. If no passwords are used, anyone who can access the workgroup can access shared resources. However, if user/group names are used, security is comparable to a client/server network.



SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

Performance	High; the server is dedicated and doesn't handle other tasks.	Low; servers often act as workstations.
Hardware Cost	High; specialized high-performance server hardware with redundancy features.	Low; any workstation can become a server by sharing resources.
Software Cost	Higher; license fees per user are part of the cost of the server OS.	Lower; client software is included with OS.
Backup	Centralized on the server; managed by network administrator. Backup by device and media only required at server.	Decentralized; managed by users. Backup devices and media are required at each workstation.
Redundancy	Yes; duplicate power supplies, hot-swappable drive arrays, and even redundant servers are common; network OS normally is capable of using redundant devices automatically.	No true redundancy among peer "servers" or clients; failures require manual intervention to correct, with a high possibility of data loss.

c) **Explain Connection oriented and connectionless services.**

(Connection oriented services: 2 marks, connection less services: 2 marks)

Connection –oriented services: is modeled after telephone system. Connection-oriented communication includes the steps of setting up a call from one computer to another, transmitting/receiving data, and then releasing the call, just like a voice phone call. However, the network connecting the computers is a packet switched network, unlike the phone system's circuit switched network. Connection-oriented communication is done in one of two ways over a packet switched network: with and without virtual circuits.

To use connection oriented service ,the service user first establishes a connection, uses the connection,and then releases the connection.

Connectionless service: is modeled after postal system. Connectionless communication is just packet switching where no call establishment and release occur. A message is broken into packets, and each packet is transferred separately. Moreover, the packets can travel different route to the destination since there is no connection. Connectionless service is typically provided by the **UDP**



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

(User Datagram Protocol), which we will examine later. The packets transferred using UDP are also called **datagrams**.

Feature	Connectionless	Connection-oriented
How is data sent?	one packet at a time	as continuous stream of packets
Do packets follow same route?	No	virtual circuit: yes without virtual circuit: no
Are resources reserved in network?	No	virtual circuit: yes without virtual circuit: no
Are resources reserved in communicating hosts?	No	yes
Can data sent can experience variable latency?	Yes	yes
Is connection establishment done?	No	yes
Is state information stored at network nodes?	No	virtual circuit: yes without virtual circuit: no

d) **Compare Hub and Switch.**
(Any four points, 1 mark each)

	Hub	Switch
Technical Specifications:	Hubs classify as Layer 1 devices in the OSI model	Network switches operate at layer two (Data Link Layer) of the OSI model.
Layer:	Physical layer(Layer 1 Device)	Data Link Layer (Layer 2 devices)
Transmission Type:	only Broadcast	At Initial Level Broadcast then Uni-cast & Multicast
Table:	There is no MAC table in Hub, Hub can't learn MAC address.	Store MAC address in lookup table and maintain address at its own, Switch can Learn MAC address.

SUMMER – 13 EXAMINATION
Model Answer

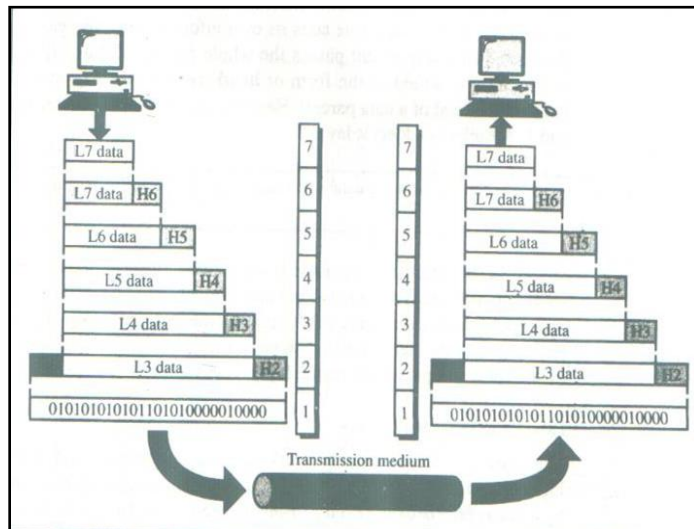
Subject Code: 12110

Subject Name: **Computer Networks**

	Hub	Switch
Collision:	In Hub collision occur.	In Full Duplex Switch no Collision occur.
Transmission Mode:	Half duplex	Full duplex
Cost:	Cheaper than switches	costlier than Hub

e) Explain the Data encapsulation in OSI Model.

(Diagram: 2 marks, explanation 2 marks)



The protocols operating at the various layers work together to supply a unified quality of service. Each protocol layer provides a service to the layers directly above and below it. The process of adding the **headers and trailers** to the data is called as **data encapsulation**. A packet(header and data) at level 7 is encapsulated in a packet at level 6.The whole packet at level 6 is encapsulated in a packet at level 5, and so on. In other words, the data portion of a packet at level N-1 carries the whole packet (data and header and maybe trailer) from level N.The concept is called **encapsulation**. The level N-1 is not aware of which part of the encapsulated packet is data and which part is the header or trailer. For level N-1, the whole packet coming from level N is treated as one integral unit.



SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

Q 6. Attempt any FOUR of the following: MARKS 16

a) State the factors to be considered for selecting transmission media

(Any 8 points, ½ marks each)

- 1.Type of medium.
2. No of conductors/connectors.
- 3.Flexibility.
- 4.Durability.
- 5.Bandwidth.
- 6.Reliability of connection
- 7.Required speed
- 8.Distance
- 9.Ease of installation and maintenance access
- 10.Technical expertise required to install and utilize
- 11.Resistance to internal EMI , cross talk of parallel wires
- 12.Resistance to external EMI outside the cable.
- 13.Attenuation characteristics
- 14.Cost

b) Describe the following terms:

(Explanation 1mark each, Diagram&/Application 1 mark)

i) TDMA

(Time Division Multiple Access),the bandwidth is just one channel that is timeshared between different stations. Each station is allocated a **time slot** during which it can send data and each station transmits its data in is assigned time slot.

ii) FDMA

(Frequency Division Multiple Access),the available bandwidth of the common channel is divided into **bands** that are separated by **guard bands**(to prevent station interferences).Each staion is allocated a band to send its data and also uses a bandpass filter to confine the transmitter frequencies.

iii) CDMA

Code Division Multiple Access (CDMA) :is a channel access method utilized by various radio communication technologies. CDMA employs **spread-spectrum technology** and a special coding

SUMMER – 13 EXAMINATION

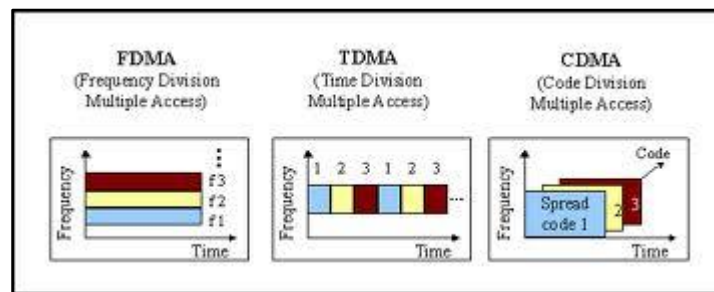
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

scheme (where each transmitter is assigned a code) to allow multiple users to be multiplexed over the same physical channel. By contrast, time division multiple access (TDMA) divides access by time, while frequency-division multiple access (FDMA) divides it by frequency.

An analogy to the problem of multiple access is a room (channel) in which people wish to communicate with each other. To avoid confusion, people could take turns speaking (time division), speak at different pitches (frequency division), or speak in different directions (spatial division). In CDMA, they would speak different languages. People speaking the same language can understand each other, but not other people. Similarly, in radio CDMA, each group of users is given a shared code. Many codes occupy the same channel, but only users associated with a particular code can understand each other.



- c) **Describe repeater. State the situation under which repeater is necessary in network.**

(Diagram -1mark, Explanation -2 marks, use /application -1mark)

Repeaters

As signals travel along a cable, they degrade and become distorted in a process called "**attenuation.**" If a cable is long enough, attenuation will finally make a signal unrecognizable. Installing a repeater enables signals to travel farther.

How Repeaters Work

A repeater works at the **physical layer** of the OSI Reference Model to **regenerate** the network's signals and resend them out on other segments. Figure shows how repeaters regenerate weak signals.

Repeaters regenerate weakened signals.

The repeater takes a weak signal from one segment, regenerates it, and passes it to the next segment. To pass data through the repeater from one segment to the next, the packets and the Logical Link

SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

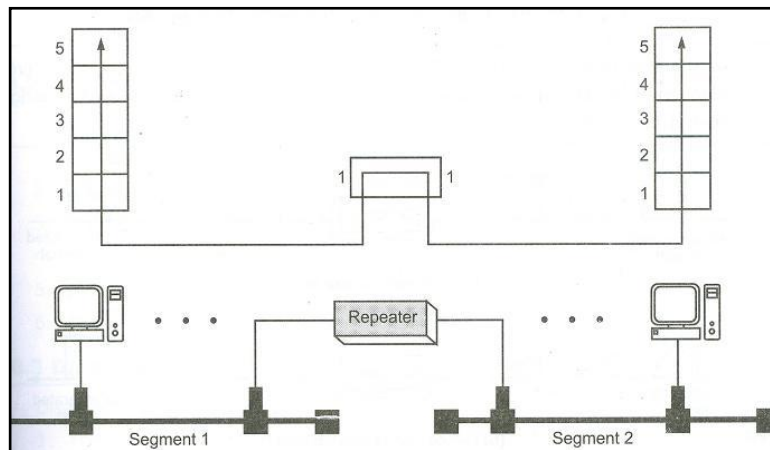
Subject Name: **Computer Networks**

Control (LLC) protocols must be identical on each segment.

A repeater will not enable communication, for example, between an 802.3 LAN (Ethernet) and an 802.5 LAN (Token Ring). Repeaters do not translate or filter signals. For a repeater to work, both segments that the repeater joins must use the same access method. The two most common access methods are carrier-sense multiple-access with collision detection (CSMA/CD) and token passing. A repeater cannot connect a segment using CSMA/CD to a segment using the token-passing access method. That is, a repeater cannot translate an Ethernet packet into a Token Ring packet.

Use a repeater to:

- Connect two segments of similar or dissimilar media.
- Regenerate the signal to increase the distance transmitted.
- Pass all traffic in both directions.
- Connect two segments in the most cost-effective manner.



Repeater



SUMMER – 13 EXAMINATION
Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

d) What are the different types of routers? Explain.

(Explanation of static router -2 marks, Dynamic router -2 marks)

(NOTE: if only Listing of routers type -1mark)

There are two types of routers: Static routers and Dynamic routers.

1.Static routers: A router with **manually configured** routing tables is known as a static router. A network administrator, with knowledge of the internetwork topology, manually builds and updates the routing table, programming all routes in the routing table. Static routers can work well for small internetworks but do not scale well to large or dynamically changing internetworks due to their manual administration.

Static routers are **not fault tolerant**. The lifetime of a manually configured static route is infinite and, therefore, static routers do not sense and recover from downed routers or downed links.

2.Dynamic routers: A router with **dynamically configured** routing tables is known as a dynamic router. Dynamic routing consists of routing tables that are built and maintained automatically through an ongoing communication between routers. This communication is facilitated by a routing protocol, a series of periodic or on-demand messages containing routing information that is exchanged between routers. Except for their initial configuration, dynamic routers require little ongoing maintenance, and therefore can scale to larger internetworks.

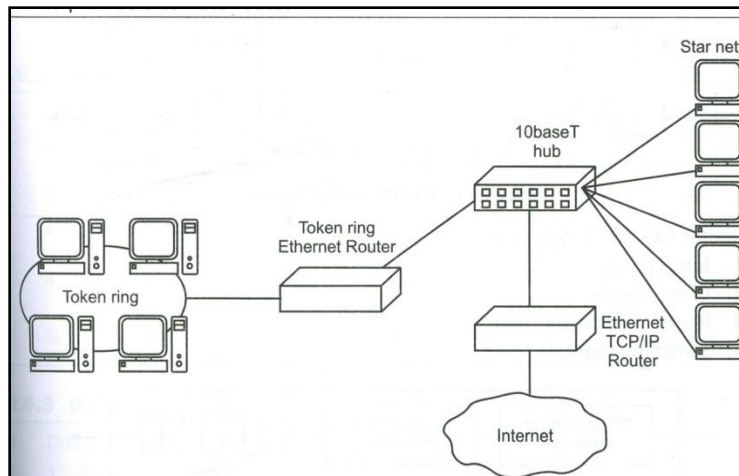
Dynamic routing is **fault tolerant**. Dynamic routes learned from other routers have a finite lifetime. If a router or link goes down, the routers sense the change in the internetwork topology through the expiration of the lifetime of the learned route in the routing table. This change can then be propagated to other routers so that all the routers on the internetwork become aware of the new internetwork topology. The ability to scale and recover from internetwork faults makes dynamic routing the better choice for medium, large, and very large internetworks.

SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**



Router

- e) **Compare IPv4 and IPv6.**
(Any four points, 1 mark each)

Comparison of IPv4 and IPv6

IPv4	IPv6
Source and destination addresses are 32 bits (4 bytes) in length.	Source and destination addresses are 128 bits (16 bytes) in length. For more information.
Uses broadcast addresses to send traffic to all nodes on a subnet.	There are no IPv6 broadcast addresses. Instead, multicast scoped addresses are used.
Fragmentation is supported at originating hosts and intermediate routers.	Fragmentation is not supported at routers. It is only supported at the originating host.
IP header includes a checksum.	IP header does not include a checksum.
IP header includes options.	All optional data is moved to IPv6 extension headers.
IPSec support is optional.	IPSec support is required in a full IPv6 implementation.
No identification of payload for QoS handling by routers is present within the IPv4 header.	Payload identification for QoS handling by routers is included in the IPv6 header using the Flow Label field..



SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**

Comparison of IPv4 and IPv6	
IPv4	IPv6
Addresses must be configured either manually or through DHCP.	Addresses can be automatically assigned using stateless address auto configuration, assigned using DHCPv6, or manually configured.
Uses host address (A) resource records in the Domain Name System (DNS) to map host names to IPv4 addresses.	Uses host address (AAAA) resource records in the Domain Name System (DNS) to map host names to IPv6 addresses.

f) **Explain human network with an example.**

(Explanation 2 marks, diagram- 1 mark, listing of types -1 mark)

Human Networks

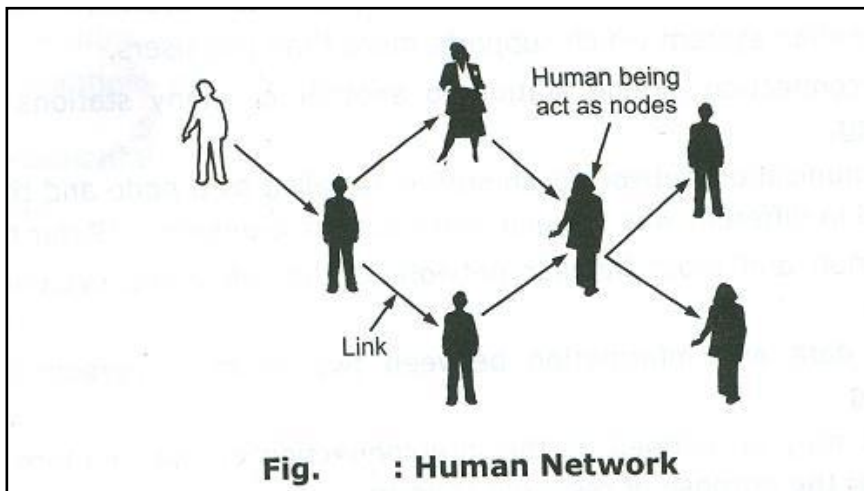
- As the name suggests human network is a network of human beings.
- Human network is a social structure which consists of individuals, organizations, schools, hospitals, workplaces and so on connected through technology.
- We may define a social network as a social structure in which the individuals and organizations act as nodes.
- The human network is generally regarded as a social structure composed of individuals, business partners, friends or other organizations connected through technology, using devices such as PCs, cell phones etc.
- A social network is a social structure made of nodes which are generally individuals or organizations.
- Social network indicates the way in which they are connected through various social familiarities ranging from casual acquaintance to close familial bonds.
- In human network nodes represent individual human beings.
- The human network connects people in number of ways, whether via emotional, cultural, ideological, familial or behavioral ties. Through most recent advances in communications technology, people are now connected through E-mail, photographs, wikis, blogs, podcasts, instant messaging and more.

SUMMER – 13 EXAMINATION

Model Answer

Subject Code: 12110

Subject Name: **Computer Networks**



There are various types of human networks, some of them are:

- 1. Peer network:** Outside the family there is community which offers a more wide array of resources for this reason the family is connected to this community to use theses resources.
- 2. Contact network:** A job searching person knows it very well that one of the best ways to find a job is network, in this case a list of friends and associates who can be helpful to find the job is prepared.
- 3. Family network:** Number of people belongs to a family network in which related people shares the resources and information.
- 4. Restaurant network:** is like client server type human network because a servers serves many clients as per their demands.