NATIONAL INSTITUTE OF TECHNOLOGY, SRINAGAR

NAME OF THE DEPARTMENT: **ELECTRONICS AND COMMUNICATION**

1 Subject Code **ECE-018FE** **Course Title** **Computer Networks**

2 Contact Hours	L	3	T	1	P	0

3 Examination Duration (Hrs)	Theory	02	Practical	00

4 Relative Weight age	M-I	20	M-II	20	ASM/CA	10	ME	50

5. Credits	0	3

6. Objective

7. Pre-requisite Nil

8. Total Contact Hours ~ 35-40.

9. Details of the syllabus:

S.No.	Particulars
1.	**Introduction of Network Model:** Principal of computer Network, Internet, protocols and standards, network models, layered task, internet model, peer-peer processes, functions of layers, OSI model and TCP/IP model.
2.	**Physical Layer:** Transmission modes, DTE-DCE Interface, Modems, Guided media, Unguided media, Performance, Multiplexing, Switching, DSL, FTTC.
3.	**Data Link Layer:** Data Link Control - Line discipline, Flow control, Error control; Data Link protocols – Asynchronous Protocols, Synchronous protocols, Character oriented protocols, Bit oriented protocols, Link Access Procedures
4.	**LANS and MANS:** Project 802, Ethernet, Token Bus, Token Ring, FDDI, Fast Ethernet, Gigabit Ethernet, DQDB, SMDS, PPP.
5.	**Network Layer:** Repeaters, Bridges, Hubs, Switches, Routers, Gateways, Routing algorithms - Shortest path routing, Distance vector routing, Link state routing; X.25 layers and protocols, Congestion control - Leaky bucket algorithm, TCP/IP Protocol Suite- IP protocol, IP addresses, Subnetting, ARP, RARP; ICMP, ISDN Services and channels, Broadband ISDN, ATM- Design goals, architecture and layers.
6.	**Transport Layer:** Duties of Transport layer, Transport connection, OSI Transport protocol, TCP, UDP.
7.	**Application Layer:** BOOTP and DHCP, DNS, TELNET, FTP, SMTP, HTTP, WWW, VoIP, Four aspects of Network security, Privacy, Digital Signatures.

10. Suggested Books

1.	**Data Communications and Networking**	**Forouzan, 4th edition, McGraw Hill, 2007**
2.	**Data and Computer Communications**	**W. Stallings, 8th edition, Prentice Hall, 2007**
3.	**Computer Networks**	**S. Tanenbaum, 4th edition, Prentice Hall, 2003**

COMPUTER NETWORKS - ECE-018FE.

UNIT-1 - Introduction to Network Model:

Computer Network:-

Defined as an interconnected set of Autonomous Computers. The term autonomous implies that the Computers can function independent of others. However, these Computers can exchange information with each other through the communication network system.

Principles of Computer Network:

A network must obey following principles.

a) Performance:-

Performance can be measured in many ways, including Transit Time and Response Time.

Transit time is the amount of time required for a message to travel from one device to another.

Response time is elapsed time between an inquiry and a response.

The performance of a network depends on a number of other factors, including the number of users, type of transmission medium, capabilities of the connected hardware and the efficiency of the software.

b) Reliability:

Network reliability is measured by the frequency of failure, the time it takes a link to recover from a failure.

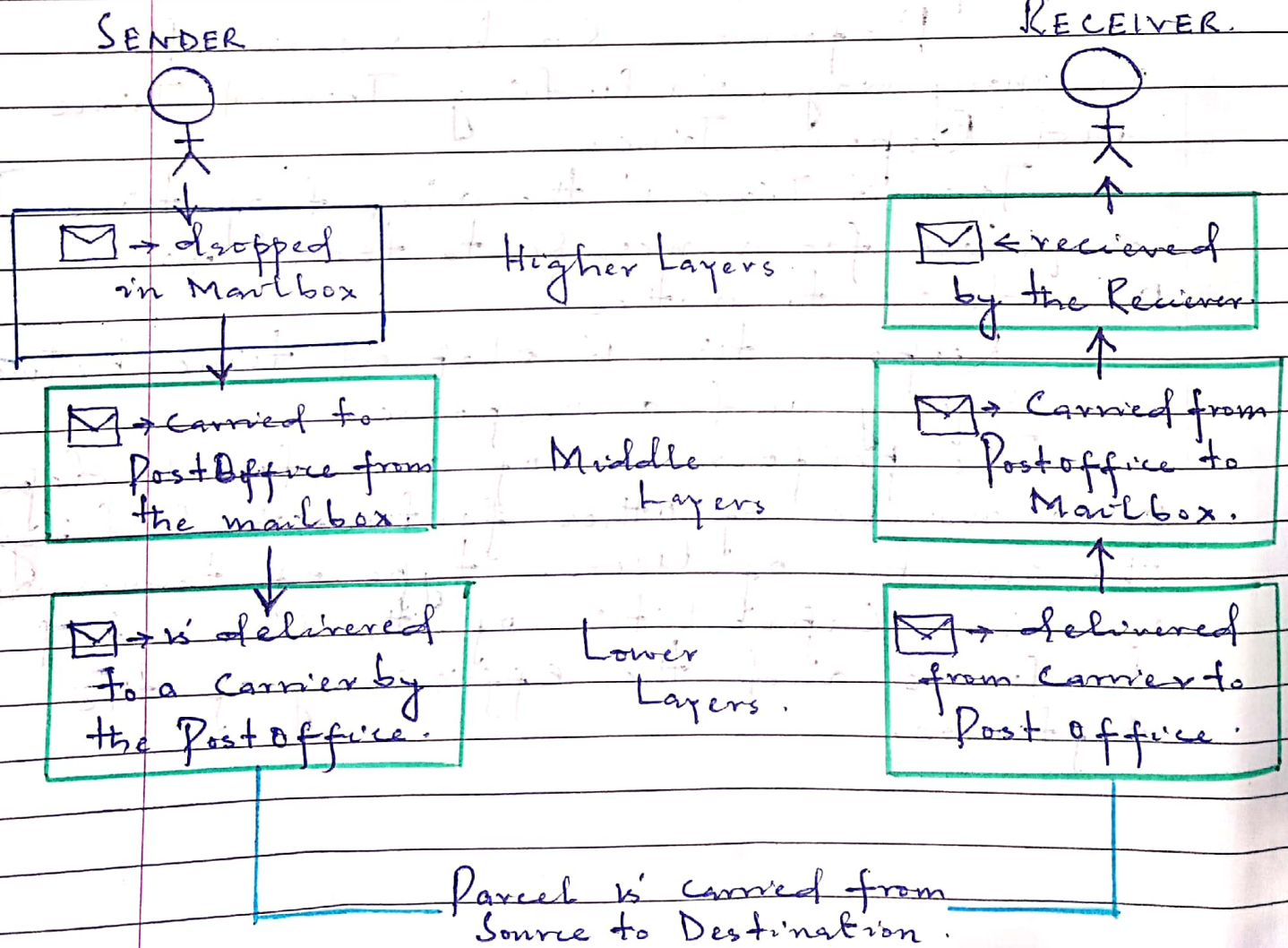
c) Security

Network Security includes protecting data from unauthorized access.

Layered Tasks:-

To understand the concept of Layered Tasks, let us consider two friends who communicate through postal mail.

The whole process involves the Sender, the Receiver and the Carrier.



According to our analysis, there are three different activities at the Sender site and another three activities at the receiver site. The task of transporting the letter between the Sender and the receiver is done by the Carrier. All the tasks must be completed in a specific order.

So we Conclude, Each layer at the Sending Site uses the Services of the layer immediately below it. The Sender at the higher layer uses the Services of the middle layer. The middle layer uses the Services of the lower Layer. The lower layer uses the Services of the Carrier.

Network Architectures.

1) Peer-to-Peer Architectures.

In this network architecture each workstation /device/node has equivalent capabilities and responsibilities.

Peer-to-Peer (P2P) is decentralized Communication model allowing each node to function as both a client and a Server.

- P2P networks are Simpler and Less Expensive.

Within a Single machine, each layer calls upon the Services of the layer just below it. Layer 3, for example uses the Services provided by Layer 2.

Between machines, layer x on one machine Communicates with layer x on another machine. This Communication

is governed by an agreed-upon series of rules and conventions called Protocols. The processes on each machine that communicate at a given layer are called Peer-to-Peer processes.

2) Client-Server Architecture :
An architecture in which each computer / process on the network is either Client or a Server.
- Servers are more powerful Computers.
- Clients are less powerful.

Important Points :-

1) Service :
A Service is a set of actions that a Layer offers to another (higher) Layer.

2) Protocol :
Protocol is a set of rules that ~~defines~~ a layer uses to exchange information with a peer entity. These rules concern both the contents and the order of the messages used.

INTERNET MODEL.

The Layered protocol stack that dominates data communications and the networking is the five-Layer Internet Model; well-known as TCP/IP protocol suite. The model is composed of 5 ordered Layers.

5) APPLICATION LAYER [Layer 5].
4) TRANSPORT LAYER [Layer 4].
3) NETWORK LAYER [Layer 3].
2) DATA LINK LAYER [Layer 2].
1) PHYSICAL LAYER. [Layer 1].

As the message passes from Soure Computer to Destination Computer, it may pass through Intermediate nodes. These intermediate nodes usually involve only first three Layers of the model.

* Within a Single machine, each layer calls upon the Services of the layer just below it. Layer 3 uses the Services provided by Layer 2.
* Between machines, Layer x on One machine Communicates with Layer x on another machine.

FUNCTIONS OF LAYERS:

1) PHYSICAL LAYER:
   a) Physical Characteristics of Interfaces and Media.
   b) Representation of Bits.
   c) Data Rate or Transmission Rate.
   d) Synchronization of Bits.

2) DATALINK LAYER:

Data Link Layer is responsible for transmitting frames, from one node to next.

Other functions include-

a) Framing.
b) Physical Addressing.
c) Flow Control.
d) Error Control.
e) Access Control.

"Data Link Layer is responsible for Hop-to-Hop [Node-to-Node] delivery."

3) NETWORK LAYER:

Network Layer is responsible for the Source-to-Destination delivery of the packet between/across multiple networks.

Other functions include-

a) Logical Addressing.
b) Routing.

4) TRANSPORT LAYER:

Transport Layer is responsible for process-to-process delivery of Entire message. The transport Layer ensures whole message arrives intact, and in-order, overseeing both Error and Flow Control at process-to-process Level.

Other functions include;

a) Port Addressing.
b) Sequencing & De-Sequencing.
c) Segmentation & Re-Assembly.
d) Connection Control.
e) Flow Control & Error Control.

Flow Control and Error Control is ensured End-to-End rather than on a single link.

5) Application Layer:-

Application layer enables the user, whether human or software to access network. It provides User Interfaces and support for services such as Electronic Mail, Remote File Access and transfer.

Other Services include-

- TELNET; SMTP; FTP; DNS; WWW.

OSI Model:.

OSI - Open System InterConnection.
- Developed by International Standards Organization. [ISO].
- Conceptual model that describes how information from a Software application in One Computer moves through a network medium to a Software application in another Computer.
- This reference model Consists of Seven (7) Layers.
- A task is assigned to each of the Seven Layers (or Group of Tasks).

1) Physical Layer;-
- Representation of Bits.
- Data Rate.
- Physical Topology.
- Line Configuration.

2) Data Link Layer;-
- Framing.
- Flow Control.
- Error Control.
- Access Control.

3) Network Layer;.
- Logical Addressing.
- Routing.

4). Transport Layer;.
- Connection Control.
- Segmentation & Re-assembly.
- Service Point Addressing.

5) Session Layer.
- Dialog Control.
- Synchronization.

6) Presentation Layer
- Translation.
- Encryption.
- Compression.

7) Application Layer.
- File transfer and management.
- Mail Service.

Important Point:-
1) As the data packets move from Lower to Upper Layers, Headers are Subtracted.
Similarly, as Data packets move from upper Layers, to Lower Layers, Headers are added.