

**Department of Technical Education**  
**DIPLOMA COURSE IN ELECTRONICS AND COMMUNICATION**  
**ENGINEERING**

**Fourth Semester**

**Subject: DATA COMMUNICATIONS AND NETWORKS**

**Contact Hrs/Week:4**

**Contact Hrs/Sem: 64**

**GENERAL EDUCATIONAL OBJECTIVES:-**

1. Understanding computer networks and its advantages
2. Understand the OSI network layer model
3. Explain the working of LAN
4. Comprehend internet technology
5. Explain the functioning of TCP/IP
6. Understand the functioning of Frame Relay and ATM

<b>Contents</b>	<b>No. of Hrs</b>
<b>UNIT-1</b>	<b>20</b>
Basics of computer networking	04
Web Applications	06
Communication process and layered architecture	10
<b>UNIT-2</b>	<b>21</b>
Communication Switching	04
TCP/IP	17
<b>UNIT-3</b>	<b>19</b>
Local Area Networks	10
Metropolitan Area Networks	04
Frame relay and ATM	05
Tests	<b>04</b>
<b>Total</b>	<b>64</b>

## **DETAILS OF CONTENTS**

### **1. Basics of Computer Networking:**

Computer Network, node, branch , network, different networks - Telephone n/w, Computer/data n/w, Entertainment/distribution/ broadcast n/w, unified/ integrated n/w, Mobile communication n/w, Necessity of computer network and advantages, Different categories of computer network.

### **2. Communication Switching:**

Introduction, Different switching techniques- Circuit switching, Packet Switching & Message, Multiplexing and its types – TDM, FDM, STDM, Connectionless and connection oriented packet switching.

### **3. Communication Process and Layered Architecture:**

Need for layered organization, OSI reference model -Explain the functions of different layers of OSI Model, Working of physical layer, The operation of modems, Types of modems- internal, external optical modems, audio modems, long haul, V-series Modem standards, Working of Data link layer, The functions of data link layer, Error control and flow control, MAC protocol- addressing mechanism, Token ring properties. Functioning of Routers, Bridges, Switches and Gateways.

### **4. Local Area Networks:**

Network Topology, Types of network topology -Bus , Star, Ring, mesh, tree, hybrid, Study of local area network, Ethernet , Ethernet properties , CSMA/CD, Ethernet Address, Ethernet frame format (IEEE 802.3), Token Ring , Token Ring frame, FDDI , FDDI frame & self healing, Token passing LANs – IEEE 802.4- token bus maintenance, frame structure. IEEE-802.5- Token ring maintenance, frame structure, Wireless LAN and Study of 802.11, Properties, Characteristics and applications of WLAN.

## **5. Metropolitan Area Networks:**

Introduction, DQDB- basics, traffic, Medium access control, Working of SMDS- basics, Medium access, billing.

## **6. TCP/IP:**

Model of TCP/IP, INTERNET Address and Physical address, Different classes of IP addresses, Dotted Decimal notation of IP address, IPv4, Address resolution Protocol ARP using message exchange, RARP, IP Datagram Format, Connectionless Datagram Delivery, Routing, Types of routing - Direct and table driven routing, TCP Basics and features of TCP, Ports and Sockets, TCP connections - Passive and Active Open, TCP Segment Format, Introduction to UDP, UDP packet format, Differences between TCP and UDP, Introduction to Domain Name System(DNS), DNS Name Space, Hierarchical Names Domain Name Resolution, Working of DNS Server, POP Server ,SMTP Server, Introduction to FTP ,FTP Basics, FTP Connections - Control Connection and Data transfer Connection, Features of TFTP.

## **7. Frame Relay and ATM:**

Need for frame relay, Working of frame relay, Frame relay switching, Frame relay frame format, Introduction to ATM, A study of packet size, large packet size, variable length packet size, Virtual circuits in ATM, ATM cell formats, ATM layer- AAL, Background of ISDN, Architecture of ATM, Channel types of ISDN, Study of ISDN Interfaces- BRI and PRI, Study the ISDN Functional groupings at the user premises.

## **8. Web Applications:**

Ways of accessing the internet- Dial-up access, SLIP, PPP, leased lines, DSL, Introduction to WWW and Browsing, Working of WEB Server, GET,HEAD, PUT,POST,DELETE,LINK ,UNLINK ,HTTP Commands, Proxy Server, Introduction to Remote Login, Local Login and Remote Login, TELNET as an alternative to a WEB Browser.

## **SPECIFIC INSTRUCTIONAL OBJECTIVES:-**

### **1. Basics of computer networking**

- 1.1 Definition of Computer Network, node, branch , network.
- 1.2 Explain different networks - Telephone n/w, computer/data n/w, entertainment/distribution/ broadcast n/w, unified/ integrated n/w, mobile communication n/w.
- 1.3 Explain the necessity of computer network and advantages.
- 1.4 Definition of different categories of computer network  
**(Refer NPTEL Website)**

### **2 Communication Switching**

- 2.1 Introduction to Switching
- 2.2 Study of different switching techniques- Circuit switching, Packet Switching & Message
- 2.3 To know about multiplexing and its types – TDM, FDM, STDM
- 2.4 Explain connectionless and connection oriented packet switching.  
(Refer Text 2)

### **3. Communication process and layered architecture**

- 3.1 Need for layered organization
- 3.2 OSI reference model -Explain the functions of different layers of OSI Model.
- 3.3 To know the working of physical layer
  - 3.3.1 To know the operation of modems, types of modems- internal, external optical modems, audio modems, long haul,
  - 3.3.2 To know V-series Modem standards
- 3.4 To know the working of Data link layer
  - 3.4.1 To know the functions of data link layer
  - 3.4.2 To understand error control and flow control
  - 3.4.3 To understand MAC protocol- addressing mechanism, token ring properties.
  - 3.4.4 To understand the operation of Routers, Bridges, Switches and Gateways  
(Refer Text 3)

### **4 Local Area Networks**

- 4.1 Definition of Network Topology
- 4.2 Explain the types of network topology -Bus, Star, Ring, mesh, tree, hybrid
- 4.3 Study of local area network, Ethernet, Ethernet properties , CSMA/CD, Ethernet Address

- 4.4 Explain the Ethernet frame format (IEEE 802.3).
- 4.5 Study of Token Ring, Token Ring frame
- 4.6 Study of FDDI, FDDI frame & self healing.
- 4.7 Study of Token passing LANs – IEEE 802.4- token bus maintenance, frame structure. IEEE-802.5- Token ring maintenance, frame structure
- 4.8 Explain wireless LAN and Study of 802.11
- 4.9 Discuss the Properties, Characteristics and applications of WLAN.  
(Refer Text 1)

## **5 Metropolitan Area Networks**

- 5.1 Introduction to MAN
- 5.2 To understand of DQDB- basics, traffic, medium access control
- 5.3 To know the working of SMDS- basics, medium access, billing  
(Refer Text 1 & NPTel Website)

## **6 TCP/IP**

- 6.1 Study the Model of TCP/IP.
- 6.2 Explain INTERNET Address and Physical address.
- 6.3 Explain the different classes of IP addresses.
- 6.4 Discuss the Dotted Decimal notation of IP address.
- 6.5 Discuss IPv4
- 6.6 Explain address resolution Protocol ARP using message exchange.
- 6.7 Explain RARP.
- 6.8 Study of IP Datagram Format
- 6.9 Discuss Connectionless Datagram Delivery.
- 6.10 Definition of Routing, explain the types of routing - Direct and table driven routing.
- 6.11 Know the TCP Basics and features of TCP.
- 6.12 Discuss Ports and Sockets
- 6.13 Explain TCP connections - Passive and Active Open.
- 6.14 Explain TCP Segment Format.
- 6.15 Introduction to UDP, Explain UDP packet format
- 6.16 Mention the differences between TCP and UDP
- 6.17 Introduction to Domain Name System, DNS Name Space.
- 6.18 Discuss Hierarchical Names Domain Name Resolution.
- 6.19 Know the Working of DNS Server.
- 6.20 Explain POP Server, SMTP Server.
- 6.21 Introduction to FTP, FTP Basics.
- 6.22 Understand FTP Connections - Control Connection and Data transfer Connection
- 6.23 Know the features of TFTP.  
(Refer Text 1)

## **7 Frame relay and ATM**

- 7.1 Explain the need for frame relay
- 7.2 To know the working of frame relay, frame relay switching
- 7.3 To know frame relay frame format
- 7.4 Introduction to ATM
- 7.5 To study the packet size, large packet size, variable length packet size.
- 7.6 To understand virtual circuits in ATM
- 7.7 To study ATM cell formats.
- 7.8 To understand ATM layer- AAL.
- 7.9 Study of Background of ISDN.
- 7.10 Explain the Architecture, Channel types of ISDN.
- 7.11 Study of ISDN Interfaces- BRI and PRI.
- 7.12 Study the ISDN Functional groupings at the user premises.  
(Refer Text 1 & NPTel Website)

## **8 Web Applications**

- 8.1 Explain the ways of accessing the internet- Dial-up access, SLIP, PPP, Leased lines
- 8.2 To know DSL
- 8.3 Introduction to WWW and Browsing.
- 8.4 Understand the working of WEB Server.
- 8.5 Discuss GET, HEAD, PUT, POST, DELETE, LINK, UNLINK, HTTP Commands.
- 8.6 Know the Proxy Server.
- 8.7 Introduction to Remote Login.
- 8.8 Discuss Local Login and Remote Login.
- 8.9 Explain TELNET as an alternative to a WEB Browser.  
(Refer Text 1)

### **TEXT BOOKS:**

1. **Data Communications and Networks- Achyut S Godbole- Tata Mcgraw-Hill**
2. **Computer Networks- 4<sup>th</sup> Edition- Andrew S Tanenbaum- Pearson-Prentice Hall**
3. **Data Communications & Networking – 4<sup>th</sup> Edition- B A Forouzan- Tata Mcgraw-Hill**
4. **Refer the course contents at NPTeL website of IIT Khargapur of course- Communication Networks and Switching**

### **REFERENCE BOOKS :-**

1. Data communication and Networks- By K Shashidhar, Sapna Publications
2. Computer Networking - James F. Kurose & Keith W. Ross- PEARSON
3. Computer Communications and Networking Technologies by Michael A. Gallo & William M. Hancock- BROOKS&COLE
4. Computer Networks and Internets by Douglas E. Comer- PEARSON.
5. Data and Computer Communications- Eighth Edition- William Stallings- Pearson Education.

**Department of Technical Education**

**MODEL QUESTION PAPER**

**Subject: Data communication and networks**

**TIME :3 HRS**

**MAX.MARKS :100**

Note: 1)Section A is compulsory.

2) Answer any two main questions from each of the remaining

Sections

**SECTION: I**

1 a **Fill in the blanks with suitable words**

5X1

- (i) The data networks are----- in nature.
- (ii) Inter net employs----- switching.
- (iii) All IP address is ----- bit long.
- (iv) TCP connections are ----- in nature.
- (v) The B Channel has a data rate of -----

b Discuss WAN addressing mechanism.

5

**SECTION: II**

2 a Define the following

		i) Computer network ii) Branch iii) Node	03
	b	What are the needs and advantages of computer networks?	05
	c	Explain with neat sketch the layer diagram of OSI reference model.	07
3	a	Explain any two types of V-Series modems	07
	b	Explain error control techniques	08
4	a	Explain how user get connected to internet using Dial- up access.	05
	b	Describe the any three HTTP commands.	06
	c	Explain the function of proxy server.	04

### SECTION: III

5	a	Explain virtual circuit approach of packet switching.	06
	b	Differentiate connection oriented and connectionless Packet switching.	03
	c	Describe STDM.	06
6	a	Explain TCP/IP reference model.	08
	b	Describe dotted decimal notation of IP address.	03
	c	Explain IPV4.	04
7	a	Describe various fields in IP datagram format.	10
	b	Mention the difference between SMTP and POP server	03
	c	What is an active open and passive open connection in TCP?	

### SECTION: IV

8	a	Explain the Bus and Ring topology.	05
	b	Describe the ETHERNET frame.	05
	c	How CSMA/CD works?	05



9	a	Explain in brief the working of the FDDI	06
	b	Explain self healing mechanism in FDDI.	04
	c	Describe IEEE802.5 token ring.	05
10	a	Explain the working of DQDB.	08
	b	Explain the need for frame relay.	04
	c	Write the ATM cell format and explain.	03