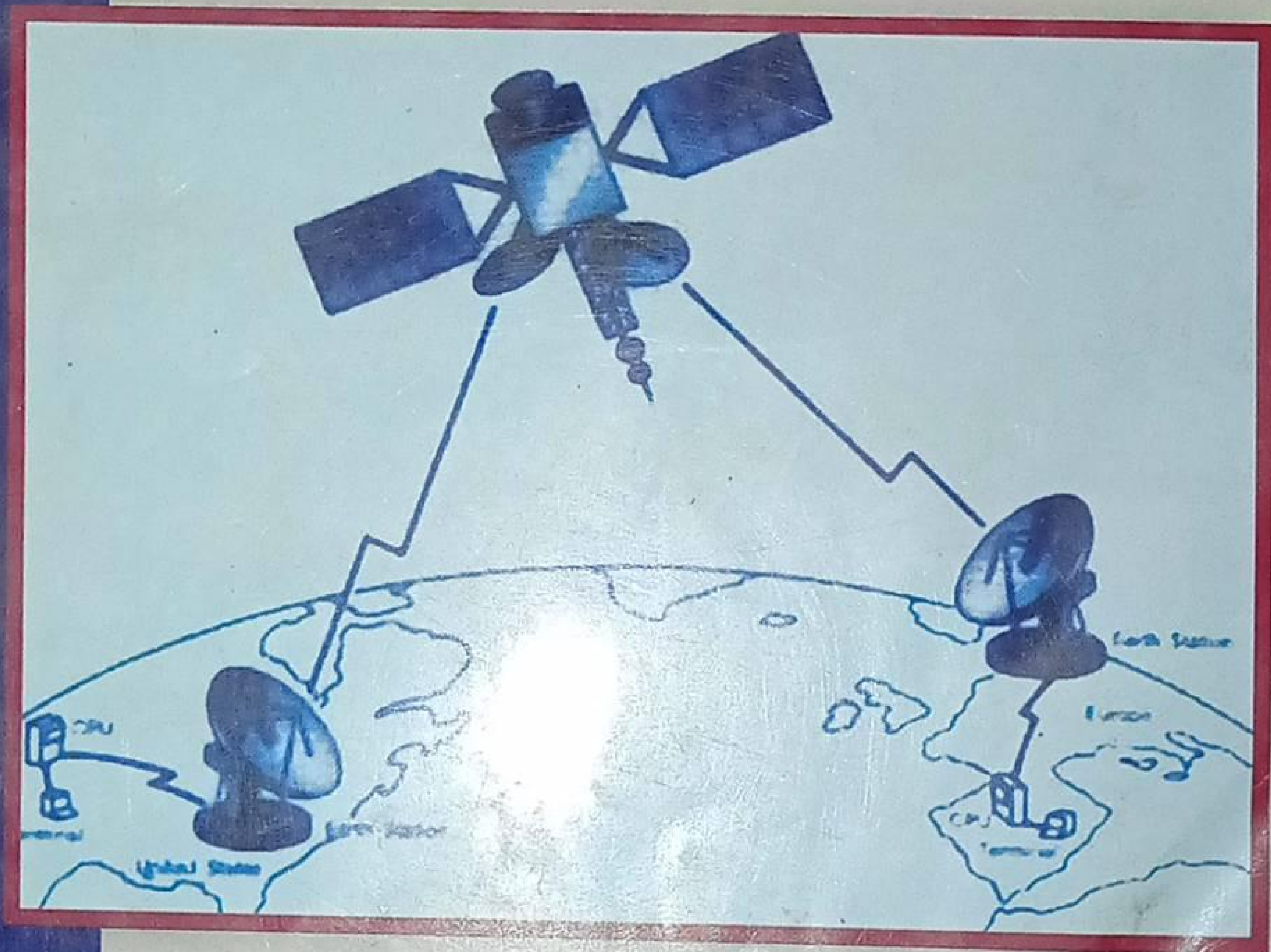


Essentials of Computer And Network Technology



Nasib S. Gill

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<i>Fingers</i>	
<i>Abacus (5000 B.C)</i>	
<i>Napier's Bones (1617)</i>	
<i>Oughtred's Slide Rule (1632)</i>	
<i>Schickard's Calculator (1623)</i>	
<i>Pascal's Calculator</i>	
<i>Leibnitz's Steppard Reckoner</i>	
<i>Jacquard's Loom (1801)</i>	
<i>Colmar's Arithmometer (1820)</i>	
<i>Babbage's Difference Engine (1823)</i>	
<i>Babbage's Analytical Engine (1833)</i>	
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<i>Hollerith's Tabulating Machine</i>	
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<i>Mark I (1944)</i>	
<i>First Generation (1946-1959)</i>	
ENIAC	
EDVAC	
EDSAC	
UNIVAC I	
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<i>Characteristics of Second Generation</i>	
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<i>Characteristics of Fifth Generation</i>	

*Recent Developments of Late 1990's
Future Technological Breakthroughs*

Classification of Digital Computers

Microcomputer

- Personal Computer (PC)*
- PC/XT*
- PC/AT*
- Super AT (or Super micros)*
- Workstation*

Categorisation of Microcomputers

- Desktop Microcomputers*
- PORTABLE MICROCOMPUTERS**
- Laptop Computers*
- Notebook Computers*
- Sub-notebook Computers*
- Handheld Computers*
- Personal Digital Assistant (PDA) Computers*

Why microcomputers are so popular ?

- Minicomputer**
- Mainframe**
- Supercomputer**

INSIGHT INTO A COMPUTER SYSTEM

Mass Storage Devices

Why Should We go for Computers today ?

- Speed*
- Accuracy*
- Automation*
- Compactness*
- Versatility*
- Diligence*
- Reliability*
- Consistency*
- Decision-making Capability*
- Storage Capacity*

Functional Similarities of Computer System With Human Being

PROBLEMS

CHAPTER - 2 : INPUT AND OUTPUT DEVICES

Introduction to Input Concepts

INPUT DEVICES

- Punched-Cards and Card Readers*

- Key Punching Machine*
- Card Reader*
- Keyboards*
- Mouse*
 - Types of Mouse*
 - Mechanical Mouse*
 - Optomechanical Mouse*
 - Optical Mouse*
 - Advantages*
 - Disadvantages*
- Joysticks*
- Trackballs*
 - Advantages*
- Touch Screens*
- Light Pens*
- Touch Pad*
- Digitizer*
 - Advantages*
 - Disadvantages*
- Voice Recognition*
 - Types of Voice Systems*
 - Continuous Speech*
 - Discrete Word*
 - Advantages*
 - Disadvantages*
- Key to Magnetic Media*
 - Key-to-tape*
 - Key-to-cartridge/cassette*
 - Key-to-disk/diskette*
 - Advantages*
 - Disadvantages*
- Financial Transaction Terminals*
 - Advantages*
 - Disadvantages*
- Machine Vision Systems*
 - Advantages*
 - Disadvantages*
- Source Data Input*
- Magnetic-ink Character Recognition (MICR)*
- Magnetic Strips*
- Optical Recognition*
- Scanners*

Terminals
Dumb Terminals
Smart Terminals
Intelligent Terminals
Point-of-Sale Terminal

OUTPUT CONCEPTS
HARD COPY DEVICES

Print Quality

Near-typeset quality
Letter-quality
Near-letter quality
Standard-quality
Draft-quality

Impact Printers

Low speed impact character printers

Dot-Matrix Printers (DMPs)

Advantages
Disadvantages

Daisy-wheel Printers

Advantages
Disadvantages

High Speed Impact Line Printers

Drum Printer

Advantages
Disadvantages

Chain Printer

Advantages
Disadvantages

Band Printer

Non Impact Printers

Low Speed Non Impact Character Printers

Ink-jet Printers

Advantages
Disadvantages

Thermal-transfer Printers

Low/High Speed Non Impact Page Printers

Thermal-Transfer Page Printer

Advantages
Disadvantages

Magnetography Technique-based Page Printers

Laser Printers

Advantages

- LED Printers
- Plotters
- Drum Plotters
- Micro-grip Plotters
- Flat-Bed Plotters
- Inkjet Plotters
- Computer Output Microfilm (COM)

SOFT-COPY DEVICES

- Monitors
 - Cathode-ray Tube
 - Flat-panel Display
 - Classification of Monitors on the Basis of Signals
 - Digital Monitors
 - Analog Computers

Features of Monitors

- Size
- Video Standards
 - Video Graphics Array (VGA)
 - Super VGA (SVGA)
 - 8514/A
 - XGA
 - TI34010

Sound Cards and Speakers

- 3D Audio
- Voice Synthesis

PROBLEMS

CHAPTER - 3 : MEMORY AND MASS STORAGE DEVICES

Introduction

Characteristics of Memory Systems

- Location
- Capacity
- Unit of Transfer
- Access Method
- Performance
- Physical Type
- Physical Characteristic
- Organization
- The Memory Hierarchy**
 - How Much ?

How Fast ?

How Expensive ?

Desirable Characteristics of Memory Unit

Types of Memory

Primary Memory

Secondary Memory

Backup Memory

Core Memory

SEMICONDUCTOR MEMORY

Core Memory Vs Semiconductor Memory

Types of Semiconductor Memories

Random Access Memory (RAM)

Static RAM (SRAM) Vs Dynamic RAM (DRAM)

Advantages of RAMs

Read Only Memory (ROM)

PROM

EPROM or UVEPROM

EEPROM (or E2PROM or EAPROM)

Advantages of ROMs

Applications of ROMs

Non-Volatile Flash Memory

Norvolatile RAM (NVRAM)

Thin Film Memory

Magnetic Bubble Memory

MAGNETIC DISKS

Disk Organization and Formatting

Data Storage on Disks

Characteristics of Magnetic Disk Systems

Head Motion

Disk Portability

Sides

Platters

Head Mechanism

Disk Access Time

Classification of Magnetic Disks

Floppy Disks

Cautions in Handling Floppy Disks

Hard Disk

Fixed Disk

Winchester Disk

Removable Cartridge

Disk Pack

Advantages of Magnetic Disks
Disadvantages of Magnetic Disks

- MAGNETIC DRUM
- MAGNETIC CARDS AND STRIPS
- ZIP DISK
- JAZ DISK
- SuperDisk
- OPTICAL DISKS

- Compact Disk (CD)*
- CD-ROM
 - Advantages of CD-ROM*
 - Disadvantages of CD-ROM*

- Compact Disk Interactive (CD-I)*
- Digital Video Interface (DVI)*
- WORM (Write Once Read Many)

- Advantages*
- Disadvantages*

- CD-R Drive
- Erasable Optical Disk or CD-RW Disk*
 - Advantages of erasable optical disk over magnetic disk*
 - Drawback*

- Optical Card*
- Optical Tape*
- Magneto-Optical Drives

MAGNETIC TAPES

- Main Characteristics of Magnetic Tapes*
- Magnetic Tape Drive And Its Types*
 - Tape Drive Using Vacuum Columns
 - Tape Drive Using Tension Arms

- Types of Magnetic Tapes*
 - Reel-to-reel Tape
 - Cassette Tape
 - Cartridge Tape

- Advantages of Magnetic Tapes*
- Disadvantages of Magnetic Tapes*

- Virtual Memory
- High Speed Memory
- Cache Memory

PROBLEMS

CHAPTER - 4 : SOFTWARE AND PROGRAMMING LANGUAGE CONCEPTS

121-164

Introduction

SOFTWARE TYPES

System Software

Application Software

Utility Software (or System Utilities)

SYSTEM SOFTWARE

Language Translators

Compiler

Interpreter

Assemblers

Operating Systems

Characteristics of Operating System

Operating Machine As An Extended Machine

Operating System As a Resource Manager

Desirable Features of Operating System

Booting (or Bootstrapping)

Classification of Operating Systems

Batch Operating Systems

Time-sharing (or Multi-user) Operating System

Multi-access Operating System

Multiprocessing Operating System

Multitasking and Multithreading Operating System

Real-time Operating Systems

Distributed Operating Systems

SYSTEM UTILITIES

Editor

Loader

Monitor

File Manager

Locator and Linker

BIOS

APPLICATION PACKAGES

General-purpose Application Packages

Application-specific Packages

Customised Application Packages

Some Other Miscellaneous Software

Firmware

Humanware (or Liveware)

Shareware

Public Domain Software

- Begware*
- Postcardware*
- Retail Software*
- Crippleware*
- Bannerware*
- Donorware*
- Freeware*

GRAPHICAL USER INTERFACE (GUI)

- Common features of GUI*
- Components of GUI*
- GUI Standards*
- Features of Microsoft Windows GUI Standard*

PROGRAMMING LANGUAGES

- First-Generation Language : Machine Language*
- Second Generation Language : Assembly Language*
- Third Generation Languages (3GLs) : High-Level Languages (HLLs)*
- Object-Oriented Languages*
- Fourth Generation Languages (4GLs) : Very High Level Languages (VHLLs)*
- Fifth Generation Languages (5GLs) : Natural Languages*

Character Codes

- BCD*
- ASCII*
- EBCDIC*

Number Systems

- Positional Number Systems*
- Types of Positional Number System*
- Non-positional Number Systems*
- Binary Number System*
- Octal Number System*
- Hexadecimal Number System*

Inter-Conversion of Decimal Number to Binary, Octal, Hexadecimal or Vice Versa

Problems

CHAPTER - 5 : DATA COMMUNICATION & COMMUNICATION PACKAGES

165-200

INTRODUCTION

- Forms of Data Transmission**
- Why Digital Data Transmission ?**
- Modem And Its Types**
 - Acoustic Modem*

External Direct-connect Modem

Internal Direct-connect Modem

COMMUNICATION CHANNELS

Wire Cable

Telegraph Cable

Telephone Cables

Twisted-pair Cable

Co-axial Cable

Microwave

Fibre Optics

Communication Satellites

Satellite Components

Laser Beams

RADAR

Communication Channel Configurations

Point-to-point Configuration

Multi-point Configuration

Polling

Contention

Channel Sharing

Multiplexing

Concentration

Controlling

Front-end Processors

DATA TRANSMISSION SPEEDS

Channel Bandwidths

Methods of Data Transmission

Asynchronous Transmission

Synchronous Transmission

MODES OF DATA TRANSMISSION

Simplex Mode

Half-duplex Mode

Full-duplex Mode

Micro-to-Micro Linkage

Micro-to-Mainframe Linkage

Communication Challenges

What are Communication Packages ?

Components Required For A Communication Package

Features of Communication Packages

Uploading and Downloading

Data-Capturing Options

Mode Switching

File-transfer Protocols

XON/XOFF Protocol

Xmodem Protocol

Kermit Protocol

Pacing Option

Character Stripping and Conversion

Break Signal

Time On-line Status

Error Handling & Error Control

Directory Storage and Automatic Dialling

Autoanswer

Automatic Message Transfer

Password Protection

Encryption

Help Window

Types of Communication Packages

Electronic Mail/Message System (EMMS)

Message Distribution Services

Voice Mail System

Advantages

Drawbacks

Electronic Mail System

Working

E-Mail Types

Benefits

Drawbacks

Bulletin Board Systems

Few Applications

Working

BBS Types

Benefits

Drawbacks

Benefits of Message Distribution Systems

Transmission of Documents and Pictures

Conferencing

Teleconferencing

Video Conferencing

Technology used

Widespread Use of Videoconferencing

Computer Conferencing

Advantages

Disadvantages

Information Services (or Information Retrieval Systems)*Working**Important Information Services*

- General Information Services
- Commercial Database Services
- Videotext Service
- Computational Information Service
- Teletext Service
- Bank-At-Home and On-line-Brokerage Services
- News Retrieval Service
- Statistical Information Service
- Gateway Services

Problems**CHAPTER - 6 : COMPUTER NETWORKS AND APPLICATIONS**

201-227

Introduction**Why Computer Network ?***Resource Sharing**Cost Reduction***Key Issues For Computer Network****Types of Computer Network****Criteria for classification of Computer Networks****LOCAL AREA NETWORK***Hardware Requirements For LAN**Transmission Channel For LAN**Network Interface Unit**Servers & Workstations**LAN Software***Wide Area Networks (WAN)***Transmission Channel For WAN**Hardware Requirements For WAN**Bridges**Routers**Gateways**X.25 Standard Interface**Types of Wide Area Networks***Public Networks****Private Networks****Some Public Networks***Integrated Services Digital Network (ISDN)*

Public Switched Telephone Network (PSTN)

Public Switched Data Network (PSDN)

Value Added Networks

Network Topology

Criteria For Selection of Network Topology

Star Network

Ring Network

Tree Network

Bus Network

Fully-interconnected Network

Advantages

Disadvantages

Multi-drop Network

Advantages

Disadvantages

Collapsed-Star Network

Network Protocols

Computer Network Architecture

Peer-to-peer Network Architecture

Client-Server Network Architecture

Applications of Computer Networks

DISTRIBUTED DATA PROCESSING

Definitions

Advantages

Cost efficiency

User Control

Backup

Response Time Improvements

Shared Resources

Disadvantages

Loss of organised control

Hardware problems

Maintenance of Remote Sites

Duplication of Software

Incompatibility of Hardware and Software

Data Redundancy

Reversion to Past Inefficiencies

Teletext and Videotext Networks

Telecommuting Systems

SOME IMPORTANT LAN HARDWARE SOLUTIONS

OSI Model of Network Architecture

Advantages of Layered Architecture

*Disadvantages of Layered Architecture***PROBLEMS****CHAPTER - 7 : INTERNET & ITS APPLICATIONS**

228-252

Introduction**What is Internet ?****History of Internet****Benefits of Internet****Who Maintains Internet ?****Hardware and Software Requirements For Internet***Computer**Modem**Linkage Mechanism**Communication Software***APPLICATIONS OF INTERNET***E-Mail (Short-Volume Transfer Service)**Mail Forwarding Services**Reminder Services**Free E-Mail**Mailing Lists**Usenet NewsGroups**World Wide Web (WWW)**Web Browsers***Miscellaneous Tools***Telnet (Remote Connection or Remote Access Service)**FTP (High Volume Transfer Service)**Modes For Using FTP**Gopher**Archie**Veronica**Mosaic**WAIS (Wide Area Information Service)**Internet Relay Chat (IRC)**Web Chat***Internet Addressing****Internet Service Providers (ISPs)***Free ISPs**Disadvantages***INTERNET IN INDIA***Shell Account**TCP/IP Account**Homepage or Website*

How to Access the Internet ?

- Accessing the Internet via Your Local Network*
- Accessing the Internet via the Telephone System*
- Internet Connection*
 - Dial-up Connection
 - Direct Connection

Internet Terminology

- Hosts and Terminals*
- TCP/IP*
- Links, URLs and Hyperspace*
- WEB Pages*
- HOME Page*
- HTML*
- File Types*

INTERNET SECURITY PROBLEMS AND SOLUTIONS

PROBLEMS

CHAPTER - 8 : OVERVIEW OF INTRANET & ITS APPLICATIONS

252-260

INTRODUCTION

EVOLUTION OF INTRANET

INTERNET Vs INTRANET

WHY INTRANET IS BECOMING SO POPULAR ?

PRE-REQUISITES FOR ESTABLISHING AN INTRANET

- Network*
- Hardware*
- Software*
- TCP/IP*
- Printing Server*
- Mail Servers*
- Web Servers*
- Integrated IP Support*
- Browsers*
- Proxy Servers*
- HTML Editors*
- Productivity Tools*
- E-Mail Front-ends*

TIPS FOR IMPLEMENTING AN INTRANET

APPLICATIONS OF INTRANET

- Video-conferencing*
- One-to-one Communication*
- Group Discussion*

On-line Electronic forms

Telecommuting

Information on demand

BENEFITS OF AN INTRANET

HOW TO MAKE INTRANET A GRAND SUCCESS?

EXTRANET

PROBLEMS

CHAPTER - 9 : COMPUTER APPLICATIONS

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INTRODUCTION

COMPUTER IN DESKTOP PUBLISHING

Newsletters

Magazines

Books

Newspapers

COMPUTER AIDED DESIGN AND MANUFACTURING

Computer Aided Design

CAD Features

CAD Applications

Computer Aided Manufacturing

CAD/CAM

Computer Integrated Manufacturing (CIM)

Manufacturing Automation Protocol (MAP)

Computer Numerical Control (CNC)

Computer Assisted Materials Requirement Planning (MRP)

COMPUTER IN PROJECT MANAGEMENT

COMPUTER APPLICATION IN SPORTS

Ticketing and Reservations

Scoreboards

Biomechanics

Cycling

Baseball

Football

COMPUTERS FOR DATA ANALYSIS

COMPUTER APPLICATIONS IN MILITARY

Missile Control

Military Communication

Military Planning

Smart Weapons

COMPUTERS IN DESIGN AND RESEARCH WORK

Design

- Research*
- Language Research*
- Legal Research*
- Dolphin Research*
- Joint Design*

POINT OF SALE TERMINALS
FINANCIAL TRANSACTION TERMINALS

- Electronic Funds Transfer*
- ATP (Automatic Transaction Process)*
- ATM (Automatic Teller Machines)*
- Smart Cards*

COMPUTERS WITH VISIONS

- OPTICRAM Cameras*
- VIDEO CAMERAS*
- Charge Coupled Device (CCD) Cameras*
- ULTRASONIC VISION*

COMPUTERS IN ARTIFICIAL INTELLIGENCE

- Expert Systems*
- Natural Language Processing (NLP)*
- Speech Recognition*
- Pattern Matching*
- Computer Vision*
- Robotics*
- Intelligent Computer-Assisted Instruction (ICAI)*
- Automatic Programming*
- Decision Support and Planning*

COMPUTERS IN BANKING APPLICATION

COMPUTERS IN EDUCATION

- Drills*
- Problem Solving*
- Dialogues*
- Tutorial Dialogue*
- Inquiry Dialogue*
- Discovery Learning*
- Instructional Simulations*
- Task Performance Simulation*
- Systems Modelling Simulation*
- Encounter Simulations*
- Computer Aided Testing (CAT)*

COMPUTERS IN INVENTORY AND QUALITY CONTROL

COMPUTERS IN MARKETING

- At-Home Shopping*
- Advertising*

Telemarketing

COMPUTERS IN MEDICINE AND HEALTH CARE

Computer Assisted Diagnosis

Multiphasic Health Testing (MPHT)

Computerised Axial Tomography (CAT or CT)

Magnetic Resonance Imaging (MRI)

Prostheses Design and Reconstruction

Computer Aided Monitoring

Pharmaceutical Design and Testing

Help for Physically Challenged

COMPUTERS IN THE ARTS

Poetry

Dance

Art

Music

Writing

COMPUTERS IN ENTERTAINMENT AND AMUSEMENT

Script-Writing

Special Effects

Computer Animation

Sound Editing

Games

ROBOTICS

Deficiencies of Robots

Vision

Touch

Mobility

Methods of Instruction

Robotic Applications

INDUSTRIAL CONTROL AND INSTRUMENTATION

COMPUTERS IN COMMUNICATIONS

REAL-TIME AND ON-LINE APPLICATIONS

PROBLEMS

CHAPTER - 10 : SOCIAL CONCERNS & COMPUTERS

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Introduction

Computer Crime

What makes Computer Crime detection difficult ?

Types of Computer Crimes

Sabotage

Theft of Services

Financial Crimes

- Data Diddling*
- Time Bomb*
- Trap Door*
- Data Stealing*
- Time Stealing*
- Electronic Eavesdropping*
- Industrial Espionage*

Safeguarding of Systems Using Password

- Identification*
- Authentication*
- Authorisation*

Computers and the Right to Privacy

How Computers Increase the Danger ?

What Society Is Afraid of ?

- Health and Security*
- Displacement and Unemployment*
- Resistance To Change*
- Copyright and Infringement*
- Computer Ethics*

SOCIETAL IMPACTS OF COMPUTERS

Positive Impacts

- Employment Opportunities*
- Planning*
- Office Automation*
- Education*
- Decision Making*
- Design and Manufacturing*
- Personal Computing*
- Robotics*
- Efficiency, Quality and Productivity*
- Medicines and Health Care*
- Management Information System (MIS)*
- Public Services*
- Best Information Retrieval System*
- Communications*
- Organisational Benefits*

Negative Impacts

- Job-loss and Displacement*
- Controlled Environment*
- Potential Damages of Automation*
- Skilled Manpower*
- Data Gathering Challenge*

Security

Privacy

Piracy

Surveillance Possibility

Computer Security and Privacy

Theft of Computer and Media

Damage due to Breakage

Environmental Damage

Inadvertent Corruption

Computer Viruses

Precautions For Computer Security

Hardware Precautions

Software Precautions

Environmental Precautions

What is a Computer Virus ?

Types of Viruses

Boot Sector Virus

File Virus

Other Types of Viruses

Worms

Logic Bombs and Time Bombs

Trojans

What viruses can do ?

DOs and DON'Ts

Precautions

Anti-Virus Software

Human Engineering

Eyestrain

Aches and Pain

Excessive Fatigue

Stress

Precautions While Using VDTs

PROBLEMS

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