

**Syllabus of M.Sc Department of Computer Science**  
**University of Peshawar**

## **M.Sc Previous**

### **PAPER-1 DATABASES**

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Entity-Relationship Model

Data Models

- a) Hierarchical, Network, Relational, Comparison of all Data Models
- b) Relation, Characteristics of Relation, Converting E-R Model into Relations.

Normalization (1NF, 2NF, 3NF, 4NF, 5NF)

Relational Algebra, Relational Calculus.

Database Design (Conceptual Design, Physical Design)

- Database administration
- Database Integrity
- Database Security
- Database Recovery
- Database Concurrency
- Distributed Databases
- Object Oriented Databases using ODMG standard (Object Model Object Definition Language (PDL)
- Object Query Language (SQL)
- Object Manipulation using the available Object Oriented Languages.

SQL.

1. Writing Basic SQL statements
2. Restricting and sorting rows
3. Single row functions
4. Displaying data from multiple tables
  - i) Join
  - ii) Different types of join
5. Aggregating data using group functions
6. Sub queries
7. Manipulating data
8. Creating and managing tables
9. Creating Views
10. Other database objects
11. Controlling User Access

PL/SQL.

1. Declaring Variables
2. Writing executable statements
3. Writing explicit cursor
4. Advance explicit cursor concepts
5. Handling Exceptions

Recommended Readings:

1. An Introduction to data base systems by C.J. Date, Addison-Wesley Publishing Company, USA, 1989
2. Database Design Gio Weiderhold, McGraw-Hill Book Company. 1992
3. Fundamentals of data base systems by S.M. Deen, Macmillan Publishing Company Ltd. England, 1994.
4. Fundamental of database system by Rameez Elmasri and S.B. Navathe, 3<sup>rd</sup> Edition, Addison Wesley, 1990.

## **PAPER-2 DATA STRUCTURES**

Introduction to algorithms & data structures. Introduction to physical data representation, data item, record, file, & blocks (fixed variables). Disk formats & track formats. The structure of sequential files, processing sequential files. The structure of indexed sequential files, processing indexed sequential files. The structure of direct files, processing direct files. Partitioned organization. System data volumes & catalog. Logical data structures. Arrays: The use of arrays, storage of arrays, accessing array elements with dope vectors, array accessing with LIFO vectors, array accessing using hashing functions, access labels, lists: queues, depueues, stack, linked lists, multiple linked lists, trees: tree terminology, tree traversing, accessing the node of a tree representation of trees in a computer system. Binary trees: Traversing binary trees, representation of binary in a computer system, accessing a binary in in-order post-order, pre-order, Graph Theory, Comparative analysis of internal sorting methods such as selection sort, bubble sort, merge sorting tree sorts, partition exchange sort, radix sort & address-calculation sort, Simulation studies of sorting using random number, Searching: sequential searching, binary searching, & hashing techniques.

Right-threaded binary tree.

### **Recommended Readings:**

1. An Introduction to data structure with application by Jean-Paul Tremblay & Paul G. Surenson, McGraw Hill, 1987.
2. Computer Data structure by John, I. Pfaltz, & McGraw-Hill 1989.
3. Data Structure by Brian Bailey, Blackie, & Son Ltd. England.,1989
4. Introduction to Computer Organization & Data structure by Harold S. Stone, McGraw-Hill Book Company, 1987.
5. Data structure using Pascal by Aaron M. Tenenbaum & Moshe J. Augenstein, Prentice-Hill Inc., New Jersey, 1985.

## **PAPER-3 OPERATING SYSTEM**

### 1. **BACKGROUND OF HARDWARE:**

Basic elements, processor registers, instruction execution, interrupt interconnection structure, the memory hierarchy & organization.

### 2. **OPERATING SYATEM----- GENERAL INTRODUCTION**

Objectives & functions, evolution of operating system, types of operating system: batch processing, time-processing & time processing systems.

### 3. **OPERATING SYSTEM AS A RESOURCE MANGER:**

#### A: **PROCESS MANAGEMENT:**

##### i) **PROCESSING CONCEPT:**

Processing definition, process control block, interrupt processing, and the nucleolus of the operating system.

##### ii) **ASYNCHRONOUS CONCUSSENT PROCESSING:**

Parallel processing, mutual exclusion sections, mutual exclusion primitives & their implementations, Decker's algorithm, N-processes mutual exclusion, semaphores.

##### iii) **DEDLOCKS:**

Resource concept, Necessary Conditions for deadlock occurrence, deadlock prevention, Avoidance, Detection & Recovery.

#### B: **STORAGE MANAGEMET:**

##### i) **REAL SRORAGE MANAGEMET:**

Contiguous Vs Non-Contiguous Storage Allocation, Single User Contiguous Storage allocation, Fixed-partitioned multiprogramming, Variable-partitioning multiprogramming & garbage collection.

##### ii) **VIRTUAL STORAGE ORGANIZATION:**

Paging, Segmentation, Combined paging & Segmentation, Protection & sharing in Virtual storage organization.

iii) VIRTUAL STORAGE MANAGEMENT:

Replacement, Placement & Fetch strategies, Resident set management, page Release, page size, principle of locality, working set theory of memory management, thrashing.

iv) SECONDARY STORAGE MANAGEMENT:

Movable-head disk scheduling policies for seek latency optimization desirable characteristics for a disk scheduling policy.

C: I/O MANAGEMENT:

Objectives & Structure of the I/O System Performance of the I/O System: Buffering, Spooling, Multiprogramming.

D: INFORMATION MANAGEMENT:

File & Database systems: file systems, functions, the data hierarchy, blocking & buffering, file organization, allocating & freeing storage space, file descriptor, access control.

E: PROCESSOR MANAGEMENT:

Job & processor scheduling levels, objectives & criteria, preemptive & non-preemptive scheduling, scheduling policies: deadline, FIFO, RR, SJF, HRN, & multi-level feedback queues scheduling.

4: OPERATING SYSTEM SECURITY:

5: A BRIEF INTRODUCTION TO ADVANCED TOPICS: NETWORK & DISTRIBUTED PROCESSING OPERATING SYSTEM:

6: UNIX OPERATING SYSTEM AS CASE STUDY:

UNIX Basics:

UNIX, UNIX Kernel, UNIX Files,

Shell Fundamentals:

Command Syntax, File names, Expressions, I/O Redirection, pipes,

Shell Commands:

File & Directory commands, selecting commands, combining & ordering commands, editors, printing & security.

Shell Decisions & Repetitions:

Shell variables, Environment variables, special variables, Quoting test. Exp. Control structure.

Recommended Books:

Tenebaum, Andrew S. Modern Operating System, Prentice Hall International Inc, 1996.

1. Colin Ritchie, Operating System, BPB Publications, 1995.
2. Lauri S. Keller, Operating Systems Prentice Hall Inc, 1992.
3. An Introduction to operating system by Harvey M. Deitel, Addison-Wesley publishing company, 1986.
4. Operating systems by William stalling, Maxwell Macmillan International editions.1985

## **PAPER-4 OBJECT-ORIENTED PROGRAMMING**

Object Oriented Programming Paradigm: Encapsulation, Information Hiding, Inheritance, & Polymorphism.

Motivation for Object-Oriented Programming: Significance of Object Orientation as a Modeling Technique, Software Reuse, & Software Maintenance. Abstraction, Encapsulation, and Information Hiding: Classes, Objects, and Class Members; Instantiation; Message Passing; Visibility qualifiers; Function Overloading. Software Reuse and Inheritance; Class Hierarchies and Information Sharing/Hiding, Inheritance versus Composition, Single and Multiple Inheritance, Inheritance and Association, Function/Method Overriding. Polymorphism: Early and Late binding of functions, Polymorphism with Function/Method Overloading and Function/Method Overriding.

Related Concepts from Java and C++: Operator Overloading, Friend and Inline Functions, Reference and Reference Parameters, Default Arguments, Virtual Functions, Virtual Functions and Polymorphism, Destructors, Copy and Conversion Constructors Interfaces, Class and Class Members Qualifiers, Function and Class Templates.

Recommended Books.

1. Object Oriented Programming using Java by Timoty Budd., Pearson Education Asia, 2000
2. Object Oriented Programming using C++ by Timoty Budd. Pearson Education Asia, 2000
3. C++How to Program by Dietal & Dietal, 2<sup>nd</sup> Edition, Prentice-Hall, 2000

5. Patric Naughton, Herbert Schildt “The Complete Reference, Java 2  
“5<sup>th</sup> ed, Osborne, MC Graw Hill corp.2002)

## **PAPER-5 DATA COMMUNICATIONS AND COMPUTER NETWORKS**

### Introduction to Basic Data Communication Concepts

- Data Communication, History, Advantage, Model
- Bits, Bytes, bps, Bauds
- Character Codes
- Parallel/Serial and Synchronous/Asynchronous Transmissions
- Simplex, Half/Full Duplex Communications
- Computer Networks, Model, Uses, Types, Topologies
- Standard-Making Organizations
- OSI Reference Model
- TCP/IP and the Internet

### The Physical Layer

- Transmission Media
- Analog and Digital transmissions
- Multiplexing and Switching
- ISDN

### The Medium Access Layer

- LAN Protocols
- IEEE Standard 802 for LANs

### The Data Link Layer

- Design Issues, Protocols, Error Detection and Correction

### The Network Layer

- Design Issues, Routing and Congestion Control Algorithms, Internetworking

### The Transport Layer

- Design Issues, Connection Management

### The Session Layer

- Design Issues, RPC

### The Presentation Layer

- Design Issues, ASN, Data Compression, and Cryptography

### The Application Layer

- Design Issues, File Management, E-mail, Virtual Terminals, etc

### Practical Work

- Networking using UNIX and MS Windows
- Network Resource Management
- Internetworking

### Recommended Readings:

1. Computer Networks by Andrew S. Tanenbaum, 2<sup>nd</sup> ed Prentice Hall , 1995
2. Computer Networks and ISDN Systems by Dr. D.C. Agarwal, 1<sup>st</sup> ed, Khanna Pub.1989
3. Data and Computer Communications by William Stallings, 5<sup>th</sup> ed Prentics Hall, 1994
4. Data Communications and Networking, Behrouz A. Forouzan, 3rd ed, McGrawHill, 2003

## **PAPER-6 DIGITAL LOGIC AND DESIGN**

Introduction: Digital Systems, Numbering Systems: Inter-conversion, Arithmetic, Complementation, Complement Arithmetic, Binary Coding Systems, and Binary Logic. Boolean Algebra and Boolean Functions: Boolean Algebra Axioms and Theorems, Boolean Functions, Representation, Simplification, and Implementation of Boolean Functions, Combinational Logic: Analysis and Design Procedures for Combinational Circuits; Design

of Combinational Circuits with MSI; Construction of adders, Magnitude Comparators, Multiplexers, Decoders, Encoders, and ROMs with MSI. Sequential Circuits: Flip-Flops, Analysis and Design Procedures for Sequential Circuits; Analysis and Design of Registers, Counters, and Memory Units. Design of a Computer System: Register Transfer Logic, Processor Logic Design, Control Logic Design, Computer Design, and Microcomputer System Design.

#### Recommended Books

1. Digital Logic and Computer Design by M. Morris Mano, Printice-Hall Publications, 2000.
2. Digital Logic by M. Morris Mano, Printice-Hall Publications.,2001