Shri VaishnavVidhyapeethVishvavidhyalaya, Indore

Institute of Computer Applications

Name of Program: MCA

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MCCA201	COMPULSORY	Digital Computer Fundamentals	3	1	0	4	60	20	20	0	0

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical;   C - Credit;
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*Teacher Assessment shall be based on following components: Quiz/Assignment/Project/Participation in class
(Given that no component shall be exceed 10 Marks)

Course Educational Objectives (CEOs):-
- To provide the students the knowledge of development of processor and its use in day to day life.
- To familiarize the students with the architecture of microprocessor and the evolution of microprocessors
- To impart knowledge about 8085 and 8086 microprocessors in particular.
- To provide practical aspects of assembly language.

Course Outcomes (COs): students will be able to
- List and specify the various features of microprocessor, memory and I/O devices including concepts of system bus.
- Understand the working, architecture and the underlying design principles of different microprocessor.
- Understand the basic functional units of a computer.
- Memory hierarchy Design.
- To understand the functioning of different peripheral devices
- Identify the various elements of 8085 microprocessor architecture, its bus organization including control signals.
- List the pin functions of the 8085 microprocessor.
- Describe the 8085 processor addressing modes, instruction classification and function of each instruction and write the assembly language programs using 8085 instructions.
- Explain the concepts of memory and I/O interfacing with 8085 processor with Programmable devices.
- List and describe the features of advance microprocessors.

Unit-I

Computer hardware generation, Number System: Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean Algebra, K-map simplification, Half Adder, Full Adder, Subtractor, Decoder, Encoders, Multiplexer, Demultiplexer, Carry look ahead adder.

Unit-II

Combinational logic Design, Flip-Flops, Registers, Counters (synchronous & asynchronous), ALU, Micro Operation. ALU-chip, Faster Algorithm and Implementation (multiplication & Division)

Unit-III

Memory Hierarchy, Main memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache memory, Virtual Memory, Memory Management Hardware, hit/miss ratio, magnetic disk and its performance, magnetic Tape etc.

Unit-IV

(Basic Organization) Von Neumann Machine (IAS Computer),Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired & micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing modes, Instruction formats, data transfer &Manipulation, I/O Organization, Bus Architecture, Programming Registers

Unit-V

Peripheral devices, I/O interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor and Serial Communication. I/O Controllers, Asynchronous data transfer, Strobe Control, Handshaking.
Concept of 8-bit micro Processor (8085) and 16-bit Micro Processor (8086)

Suggested Readings:
1. Zaky & Hamacher, "Computer Organization", McGraw Hill
2. Tannenbaum, "Structured Computer Organization", PHI
3. B. Ram, "Computer Fundamental Architecture & Organization", New Age
4. Computer System Architecture by Morris Mano
5. Computer Organization and Architecture-I ... Sloan,M.E.:, 2nd edition Galgotia publication.

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							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MCCA202	COMPULSORY	Computer Networks	3	1	0	4	60	20	20	0	0

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Course Educational Objectives (CEOs):
- To develop an understanding of modern network architectures.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To clarify network terminology.
- To provide knowledge about**TCP/IP**.
- To expose students to emerging technologies and their potential impact.

Course Outcomes (COs) (COs): students will be able to
- Knowing and Applying pieces of hardware and software to make networks more efficient, secure, easier to use, able to transmit several simultaneous messages, and able to interconnect with other networks.
- Differentiating the various types of network configurations and applying them to meet the changing and challenging networking needs of organizations.
- Defining and analyzing the circuits available for voice and data networks, their transmission speeds (bandwidth), and how they are packaged for commercial use.
- Defining the different protocols, software, and network architectures. Local area networks, their topologies, protocols and applications.
- Analyzing why networks need security and control, what errors might occur, and how to control network errors.

Unit I:
Computer Network: Introduction, Layered Architecture - ISO-OSI Model, Transmission Fundamentals - Communication Media - Conductive Metal (Wired Cable), Optical Fiber links, Wireless Communication - Radio links, Satellite Links. Topologies. Communication Services & Devices, Telephone System., Integrated Service Digital Network (ISDN)., Cellular Phone., Digital to Analog Conversion - Frequency Modulation (FM), Amplitude, Modulation (AM), Phase Modulation (PM). Analog to Digital Conversion - Pulse Amplitude Modulation(PAM), Pulse Code Modulation (PCM), Differential Pulse Code Modulation, (DPCM), Modem & Modem Types.
Multiplexing- Frequency Division Multiplexing (FDM). Time Division Multiplexing (TDM), Statistical Time Division Multiplexing (STDM).

UNIT II:
Contention Protocol-Stop-Go-Access Protocol, Carrier sense multiple access with collision detection (CSMA/CD).
Framing – Flow and error control, Data Security and Integrity: Parity Checking Code, Cyclic redundancy checks (CRC), Hemming Code, Protocols for Noise less and Noise Channels, Concepts, Basic flow control, Sliding window protocol-Go-Back-N protocol and selective repeat protocol. Wired LAN, IEEE standard: Ethernet – Standard, Fast Ethernet and Giga Bit Ethernet.

Unit III:
Connecting LANS: Connecting devices - Backbone networks - Virtual LANS, Virtual circuit networks: Architecture and Layers of Frame Relay and ATM.
Token Ring : 802.5 IEEE standard, Token Bus : 802.4 IEEE standard, FDDI Protocol, DQDB Protocol, Inter-Networking, Layer 1 connections-Repeater, Hubs, Layer 2 connections-Bridges, Switches, Layer 3 connections-Routers, Gateways.

Unit IV:
Wide Area Network: Introduction, Network routing, Routing Tables, Types of routing, Dijkstra's Algorithm, Open shortest path first, Flooding, Broadcasting, Multicasting, Congestion & Dead Lock, Quality of services (QoS) – Techniques to improve QoS.
Internet Protocols, Overview of TCP/IP, Transport protocols, Elements of Transport Protocol, Transmission control protocol (TCP), User data-gram protocol (UDP).

Unit V:
Network Security: Cryptography – Symmetric key and Public Key algorithms - Digital signature – Management of Public keys – Communication Security – Authentication Protocols. Virtual Terminal Protocol, firewalls, Fire wall   policies and rules, Common Problem with Packet Filtering. Overview of DNS- E-mail – FTP – WWW – HTTP – Multimedia. IP Management Protocol, SNMP: Agents and Managers, Organization, Object identifiers, problems.

Suggested Readings:

1. A.S.Tanenbaum, "Computer Network", 4th addition,PHI
2. Forouzan "Data Communication and Networking 3ed", TMH
3. J.F.Hayes, "Moduling and Analysis of Computer Communication Networks", Plenum Press
4. D.E.Comer, "Internetworking with TCP/IP", Volume Ist & IInd, PHI
5. Willium Stalling, "Data & Computer communications",Maxwell Macmillan International Ed.
6. D.Bertsekas and R.Gallager,"Data Networks", 2nd Ed. ,PHI.
7. G.E. Keiser ,"Local Area Networks ", McGraw Hill, International Ed.

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MCCA203	COMPULSORY	Data Base Management System	3	1	4	6	60	20	20	30	20

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Course Educational Objectives (CEOs):

- To provide students with basic concepts in information system and the benefits of these systems
- To provide the knowledge ofsystems definition, systems requirements and information needed by the decision maker
- To understand the role,requirement and operations that an analyst needed to analyze, design, and implement the systems
- To identify several methods to enhance and develop information systems and to manage the information system recourses
- To explain several ethical issues in information system
- To provide the knowledge of business data modeling for the designing of efficient information systems
- To explain the various issues related with Data Security.

Course Outcomes (COs): After completing this course the student will be able to:

- To differentiate between data, information, and knowledge
- Create, maintain and manipulate a relational database using SQL

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- Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing an information system
- Describe the characteristics of database transactions and how they affect database integrity and consistency.
- Understand the difference between database and data warehouse, transaction processing system and functional area information system
- To design the efficient database system using normalization
- Define the information systems and differentiate information systems Identify the threats to information security and to protect information recourses
- Analyze the basic concepts and architecture associated with DBMS
- to analyze any environment to determine their tables to construct database
- information systems that support organization, management, Decision making
- to plan, acquire, and maintain information systems.

UNIT-I
Introduction: Introduction to Databases, Purpose of Database System- Database System, Database system Vs file system, Database System concepts and architecture, Advantage of DBMS approach, various view of data, data independence, schema and subschema and instances, primary concepts of data models, Database languages, Database administrator and users, data dictionary.

ER model: basic concepts, notation for ER diagram, design issues, mapping constraint, Concepts of keys: super, candidate, primary, alternate, foreign, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables, reduction of ER diagrams to tables, extended ER model, relationships of higher degree.

UNIT-II
Relational Algebra: Relational data Model and Language: concepts, domains, relations, kind of relations, relational database, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, the structure, relational algebra with extended operations, modifications of Database.

Relational Calculus: idea of relational calculus, tuple and domain calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.

Relational Database Design: basic concepts and definitions, trivial and non trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, Canonical Cover,

Normalization: introduction, non loss decomposition, FD diagram, first, second, third Normal forms, dependency preservation, BCNF, multivalued dependencies and fourth normal form, Join dependency and fifth normal form. Codd's rules, Relational Schemas, Introduction to UML, Alternative approaches to database design.

UNIT-III
SQL: Introduction, basic structure of SQL, Characteristics and Advantage of SQL set operations, aggregate functions, null values, SQL data types and literals. SQL operators, Types of SQL commands. nested sub queries, derived relations, views, modification of Database, join relations,

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Views: Introduction to views, data independence, security, updates on views, comparison between tables and views

Queries and sub queries. Aggregate functions. Insert, update and delete operations. Joins, Unions, Intersection, Minus, Cursors, Triggers in SQL.

Distributed Database: basic idea, distributed data storage, data replication, data fragmentation horizontal, vertical and mixed fragmentation

UNIT-IV

Transaction, concurrency and Recovery: basic concepts, ACID properties, Transaction states, Implementation of atomicity and durability, concurrent executions, basic idea of serializability, concurrency control, deadlock, failure classification, storage structure types, stable storage implementation, data access, recovery and atomicity- log based recovery, deferred Database modification, immediate Database modification, checkpoints.

UNIT-V

Storage structure and file organizations: overview of physical storage media, magnetic disks performance and optimization, basic idea of RAID, file organization, Sequential, Pointer, Indexed, Direct organization of Records in Files – Indexing and Hashing, ordered indices, Static and Dynamic hashing, basic idea of B-tree and B+-tree organization

Network and hierarchical models: basic idea, data structure diagrams, DBTG model, comparison of the three models.

DATABASE SECURITY: Data Classification-Threats and risks – Database access Control – Types of Privileges –Cryptography

Suggested Readings:
1. A Silberschatz, H.F Korth, Sudersan "Database System Concepts" –, MGH Publication.
2. C.J. Date "An introduction to Database Systems" –6th ed.
3. Elmasri & Navathe "Fundamentals of Database systems" – III ed.
4. B.C. Desai. "An introduction to Database systems" , BPB
5. Raghurama Krishnan "Database Systems" , TMH

List of Experiments:
1. To study Basic SQL commands (create database, create table, use, drop, insert) and execute the following queries using these commands:
   - Create a database named 'Employee'.
   - Use the database 'Employee' and create a table 'Emp' with attributes 'ename', ecity', 'salary', 'enumber','eaddress','depttname'.
   - Create another table 'Company' with attributes 'cname', ccity','empnumber' in the database 'Employee'.

2 To study the viewing commands (select , update) and execute the following queries using these commands:
   - Find the names of all employees who live in Delhi.
   - Increase the salary of all employees by Rs. 5,000.

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- Find the company names where the number of employees is greater than 10,000.
- Change the Company City to Gurgaon where the Company name is 'TCS'.

3. To study the commands to modify the structure of table (alter, delete) and execute the following queries using these commands:
- Add an attribute named ' Designation' to the table 'Emp'.
- Modify the table 'Emp', Change the datatype of 'salary' attribute to float.
- Drop the attribute 'depttname' from the table 'emp'.
- Delete the entries from the table ' Company' where the number of employees are less than 500.

4. To use (and, or, in , not in, between , not between , like , not like) in compound conditions and execute the following queries using them:
- Find the names of all employees who live in ' Gurgaon' and whose salary is between Rs. 20,000 and Rs. 30,000.
- Find the names of all employees whose names begin with either letter 'A' or 'B'.
- Find the company names where the company city is 'Delhi' and the number of employees is not between 5000 and 10,000.
- Find the names of all companies that do not end with letter 'A'.

5. Using aggregate functions execute the following queries:
- Find the sum and average of salaries of all employees in computer science department.
- Find the number of all employees who live in Delhi.
- Find the maximum and the minimum salary in the HR department.

6. To execute the following queries using study the grouping commands (group by, order by)

List all employee names in descending order.
- Find number of employees in each department where number of employees is greater than 5.
- List all the department names where average salary of a department is Rs.10,000.

7. To write SQL queries
    Alter table 'Emp' and make 'enumber' as the primary key.
- Alter table 'Company' and add the foreign key constraint.
- Add a check constraint in the table 'Emp' such that salary has the value between 0 and Rs.1,00,000.
- Alter table 'Company' and add unique constraint to column cname.
- Add a default constraint to column ccity of table company with the value 'Delhi'.
- Rename the name of database to 'Employee1'.
- Rename the name of table 'Emp' to 'Emp1'.
- Change the name of the attribute 'ename' to 'empname'.

10. To execute following queries using appropriate

Retrieve the complete record of an employee and its company from both the table using joins.
- List all the employees working in the company 'TCS'.

11. To study the various set operations and execute the following queries using these commands:
- List the enumber of all employees who live in Delhi and whose company is in Gurgaon or if both conditions are true.
- List the enumber of all employees who live in Delhi but whose company is not in Gurgaon.

12. To study the various scalar functions and string functions (power, square, substring, reverse, upper, lower, concatenation) and execute the following queries using these commands:
- Reverse the names of all employees.
- Change the names of company cities to uppercase.
- Concatenate name and city of the employee.

13. To study the commands for views and execute the following queries using these commands:
- Create a view having ename and ecity.
- In the above view change the ecity to 'Delhi' where ename is 'John'.
- Create a view having attributes from both the tables.
- Update the above view and increase the salary of all employees of IT department by Rs.1000.

14. To study the commands involving indexes and execute the following queries:
- Create an index with attribute ename on the table employee.
- Create a composite index with attributes cname and ccity on table company.
- Drop all indexes created on table company.

16. To study the conditional controls and case statement in PL-SQL and execute the following queries:
- Calculate the average salary from table 'Emp' and print increase the salary if the average salary is less that 10,000.
- Print the deptno from the employee table using the case statement if the deptname is 'Technical' then deptno is 1, if the deptname is 'HR' then the deptno is 2 else deptno is 3.

17. To study procedures and triggers in PL-SQL and execute the following queries:
- Create a procedure on table employee to display the details of employee to display the details of employees by providing them value of salaries during execution.
- Create a trigger on table company for deletion where the whole table is displayed when delete operation is performed.

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							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MCCA204	COMPULSORY	Introduction to Operating System	3	1	0	4	60	20	20	0	0

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Course Educational Objectives (CEOs):-

1. To provide knowledge of the underlying principles, techniques and approaches of designing an operating systems.
2. To provide the knowledge of inherent functionality and processing of program execution.
3. To emphasize on how the various elements that underlie operating system interact and provides services for execution of application software
4. To make the students aware with the different Operating Systems.

Course Outcomes (COs): After the completion of the course student will be able to

1. Understand the functions, structures and history of operating systems.
2. Understand the design issues associated with operating systems.
3. Understand and apply various process management concepts including scheduling, synchronization, deadlocks and multithreading.
4. Demonstrate the concepts of memory management including virtual memory.
5. Master system resources sharing among the users.
6. Apply the knowledge related to file system interface and implementation, disk management.
7. Be familiar with protection and security mechanisms.
8. Be familiar with various types of operating systems including Unix.
9. Students will demonstrate knowledge of process control, threads, concurrency, memory management scheduling, I/O and files, distributed systems, security, networking.
10. Enumerate and explain the function of the common operating system kernel routines that are provided by an operating system.

UNIT - I
Introduction: Evolution of OS with the generations of computers. Goals, Objectives, Functions of Operating System, Types of operating systems: Batch Processing, Multitasking, Multithreading, Multiprogramming and Real time operating systems etc. Different views of the operating system, System Programmer's view, User's view, Operating System structure: Layered Operating Systems, Monolithic Systems.

UNIT – II
CPU Scheduling: Processes, The Process concept, the process control block, Systems programmer's view of processes. Types of scheduler, Scheduling Criteria, Scheduling Algorithms.
Deadlocks: Deadlock, Condition for deadlock, Deadlock Prevention, Deadlock detection, Deadlock avoidance, Deadlock recovery, Starvation.

UNIT - III
Memory Management : Memory management without swapping or paging, Concept benefits of Virtual memory, Concepts of swapping and paging, Fragmentation, Page replacement algorithms, Belady's anomaly and the category of Stack algorithms, Modeling paging algorithms, Design issues for paging system, Segmentation.

UNIT-IV
Concurrency and Synchronization: The need for inter-process synchronization, Principles of concurrency, Process interaction, Requirement for Mutual Exclusion, Mutual Exclusion Software Applications, Decker's algorithms, Mutual Exclusion Hardware support, Semaphore, Classical problems in concurrent programming, Dining Philosopher's problem, Bounded Buffer Problem, Sleeping Barber Problem, Readers and Writers problem, Critical section, critical region and conditional critical region, Monitors and messages.

UNIT-V
I/O Management and Disk scheduling: I/O devices, device controllers, direct memory access, Organization of I/O function, and Characteristics of I/O channels. OS design issues, Logical structure of I/O function, I/O buffering, Goals of I/O s/w, interrupt handlers, device drivers, and device independent I/O.
Disks: Disk hardware, Disk I/O & Disk performance parameters and Disk scheduling policies(First come first serve, shortest seek time first, SCAN, C-SCAN, LOOK and C-LOOK algorithms.

Suggested Readings:
1. Deitel, H.M. "An Introduction to Operating Systems". Addison Wesley Publishing, 1984.
2. Milenkovic, M., "Operating Systems - concepts and Design" McGraw Hill International Edition-1992.
3. Galvin P., J.L. Abraham Silberschatz. "Operating System Concepts". John Wiley & Sons,1989.
4. Tanenbaum, A.S. "Modern Operating System", Prentice Hall of India Pvt. Ltd.1995.
5. William Stallings "Operating Systems" , Prentice Hall of India Pvt. Ltd.

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MCCA205	COMPULSORY	Data Structure	3	1	4	6	60	20	20	30	20

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Course Educational Objectives (CEOs):-
- To develop the understanding among the students with the applications of Standard data structure in real world problems.
- To get a good understanding of applications of Data Structures.
- The analysis and evaluation of the data structure needs of particular problems;
- To provide knowledge of the fundamental design, analysis and implementation of data structures and algorithms;
- creation of new data structures.
- To familiarize the students with the analysis and design a particular problem**.**

Course Outcomes (COs) (COs): :-students will be able to
- Demonstrate familiarity with major algorithms and use of appropriate data structures.
- Analyze performance of algorithms.
- Determine which algorithm or data structure to use in different scenarios
- Be familiar with writing recursive methods.
- **Apply** programming techniques such as pointers, dynamic memory allocation, structures to developing solutions for particular problems
- Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs
- Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, heap sort and quick sort.
- Understand and apply fundamental algorithmic problems including Tree traversals, Graphtraversals, and shortest paths.
- Demonstrate understanding of various searching algorithms.

- Program multiple file programs in a manner that allows for reusability of code.
- Compare different implementations of data structures and to recognize the advantages and disadvantages of the different implementations.
- **Design** and **implement** C programs that apply abstract data types.

UNIT - I

The Concept of Data Structure, Abstract Data Type, Concept of List and Array, Introduction to Stack, Stack as an Abstract Data Type, Primitive Operations on Stack, Stack's Applications - polish notations Infix, Postfix, Prefix and Recursion, evaluation of post and prefix expressions.. Introduction to Queues, Primitive operations on Queues, Queue as an Abstract Data type, Circular Queue, Dequeue, Priority Queue, Applications of Queue.

UNIT - II

Linked List - Introduction to Linked List, Memory Representations of Linked List, comparison; Operations on Linked List, Linked Representation of Stack and Queue, Header Nodes. Types of Linked List: Doubly Linked List, Circular Linked List, Application of Linked List, Self Referential Structures.

UNIT –III

Trees: Definition, Basic Terminology of Trees, Tree Representations as Array and Linked. Binary Trees, Binary Tree Operations. Traversal of Binary Trees - Inorder, Preorder & Postorder, complete binary tree, almost complete binary tree; Application of Binary Tree, Threaded Binary tree, Height Balanced tree, B-tree. Forests, Conversion of forest into tree. Heap: definition.

UNIT-IV

Complexity: concept and notations. Searching: Sequential Search, Binary Search and their Comparison. Sorting - External and Internal Sorting, Insertion Sort, Selection Sort, Quick Sort, Bubble Sort, Heap Sort, Comparison of Sorting Methods. Hashing;

UNIT-V

Graphs - Introduction to Graphs, Basic Terminology, Directed, Undirected and Weighted graph, Representation of Graphs, Graph Traversals - Depth First and Breadth First Search. Applications of Graphs: Spanning Trees, Minimum Cost Spanning Tree, Shortest Path Problem: Kruskal's and Dijkstra algorithms.

Suggested Readings:

1. Kruse R.L. Data Structures and Program Design in C; PHI
2. Aho "Data Structure & Algorithms".
3. Trembly *& SORRENSON* "Introduction to Data Structure with Applications".
4. TennenBaum A.M. & others: Data Structures using C & C++; PHI
5. Horowitz & Sawhaney: Fundamentals of Data Structures, Galgotia Publishers.
6. Yashwant Kanetkar, Understanding Pointers in C, BPB.
7. Data structure: by Lipschuists (schaum 's outline series mcgraw hill publication)

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8. Fundamentals of Computer Algorithm: by Ellis Horowitz and Sartaj Sawhney

List of Experiments:

1. Write a program to create a two dimensional array and perform add, subtract and multiplication operations.
2. Write a program to create a two dimensional array using dynamic memory allocation.
3. Write a program to implement stack.
4. Write a program to convert infix expression into postfix expression.
5. Write a program to check balanced parentheses for a given infix expression.
6. Write a program to evaluate postfix expression.
7. Write a program to implement queue.
8. Write a program to implement circular queue.
9. Write a program to implement link list with insert, delete, search, view, and delete function.
10. Write a program to implement ordered link list.
11. Write a program to add two polynomials.
12. Write a program to create doubly link list.
13. Write a program to implement tree with insert, delete and search function.
14. Write a program for in order, post order and preorder traversal of tree.
15. Write a program for binary search and sequential search using recursion.
16. Write a program for bubble sort and sequential search.
17. Write a program for insertion sort and quick sort.

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