THIRUVALLUVAR UNIVERSITY

M.Phil / Ph.D Entrance Examination SYLLABUS

COMPUTER SCIENCE

UNIT I

Computer Organization and Architecture

Basic of Computer, Von Neumann Architecture, Generation of Computer, Classification of Computers, Instruction Execution. Register Transfer, Bus and Memory Transfers, Three-State Bus Buffers, Memory Transfer, Micro-Operations, Register Transfer Micro-Operations, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations. Stack Organization, Register Stack, Memory Stack, Reverse Polish Notation.

Instruction Formats, Three- Address Instructions, Two – Address Instructions, One - Address Instructions, Zero - Address Instructions, RISC Instructions, Addressing Modes. RISC & CISC. Addition And Subtraction With Signed-Magnitude, Multiplication Algorithm, Booth Multiplication Algorithm, Array Multiplier, Division Algorithm, Hardware Algorithm, Divide Overflow, Floating-Point Arithmetic Operations, Decimal Arithmetic Operations, BCD Adder, BCD Subtraction. Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPU-IOP Communication. Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory, Virtual Memory, Associative Memory. Control memory – Address sequencing.

UNIT II

Digital Logic and Fundamentals

Number Systems and Codes: Number System – Base Conversion – Binary Codes – Code Conversion. Logic Gates – Truth Tables – Universal Gates. Boolean Algebra – Simplification of Boolean Functions – Using Theorems, K-Map – Binary Arithmetic: Binary Addition – Subtraction – Adder – Subtractor. Combinational Logic: Multiplexers – Demultiplexers – Decoders – Encoders. Sequential Logic: RS, JK, D, and T Flip-Flops – Master-Slave Flip-Flops. Registers: Shift Registers – Types of Shift Registers. Counters: Asynchronous and Synchronous Counters - Ripple, Mod, Up-Down Counters– Ring Counters. Memory: Basic Terms and Ideas –Types of ROMs – Types of RAMs.

UNIT III

Data Structures and Algorithms

Introduction of algorithms - analyzing algorithms, Arrays, Stacks and queues, Application of Stack: Evaluation of Expression - Infix to postfix Conversion - Sparse Matrices. Linked list : Singly Linked list - polynomial addition - Doubly linked List and Dynamic Storage Management - Garbage collection and compaction. Trees - Binary trees - Traversal - Threaded Binary trees, Graphs: - Traversals, connected components and spanning Trees, Single Source Shortest path problem - Hash Tables - Hashing Functions. External sorting : Storage Devices- K-way merging - sorting with tapes. Internal sorting : Insertion sort - Quick sort - 2 way Merge sort - Heap sort - shell sort - sorting on keys. Files: Files, Queries and sequential organizations - Index Techniques - File organization.

Design and Analysis of Algorithms

Algorithm Definition – Algorithm Specification – Performance Analysis-Asymptotic Notations. Elementary Data Structures: Stacks and Queues – Trees – Dictionaries – Priority Queues – Sets and Disjoint Set Union – Graphs - Divide and Conquer - The Greedy Method - Dynamic Programming - Backtracking

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UNIT IV

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Database Management Systems

Introduction: Database System Applications-DBMS Vs. File System - View of Data-Data Model Database Languages - Database users and Administrators - Database System Structure. Data Models: Basic Concepts - Constraint- Keys- ER Diagram - Weak Entity - Extended ER Features - UML; Relational Model: Structure of Relational Databases - Relational Algebra - Set Operation-Aggregate Function-Null Values-Nested Sub Queries - Views - Modification of the Database - Data Definition Language - Embedded SQL - Dynamic SQL. Advance SQL : Integrity and Security: Domain - Constraint - Referential Integrity - assertions - Triggers - Security and Authorization. Relational Database Design: First Normal Form - Pitfalls in Relational Database Design-Functional Dependencies - Boyce-Codd Normal Form - Third Normal Form - Fourth Normal Form - Overall Database Design Process. Transaction Management: Transaction concepts - States - Serializability. Lock based concurrency control: Locks - Granting - Two-Phase Locking protocol. Time stamp based protocol: Timestamps - Timestamp ordering protocol - Dead lock handling.

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UNIT V

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Operating Systems

Introduction - History of operating system- Different kinds of operating system – Operating system concepts - System calls-Operating system structure. Processes and Threads: Processes - threads - thread model and usage - Inter process communication. Scheduling - Memory Management: Memory Abstraction - Virtual Memory - Page replacement algorithms. Deadlocks: Resources- introduction to deadlocks - deadlock detection and recovery - deadlocks avoidance - deadlock prevention. Input / Output: principles of I/O hardware - principles of I/O software. Files systems: Files - directories - files systems implementation - File System Management and Optimization.

LINUX and Shell Programming

Introduction to Linux : operating system and Linux - History of Linux and Unix - Linux overview - Linux Distributions - Vi editors. Shell - comparison of Shells - working in the shell - Learning Basic Commands - Compiler and interpreter differences - various directories - Drilling deep into process management, job control and Automation. Text processing - Text filtering Tools - working with commands. - Logical operators. - local variables and its scope - working with arrays.

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UNIT VI

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Computer Networks

Introduction – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Data Communication - Guided Transmission Media. Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer:

Design Issues – Error Detection and Correction. Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth. Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols. Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography.

UNIT VII

Software Engineering

Introduction - Software Life Cycle Models - Classical Waterfall Model -Iterative Waterfall Model - Prototyping Model - Evolutionary Model - Spiral Model. Software Project Management: Responsibilities of a Software Project Manager - Project Planning - Metrics for Project Size Estimation - Project Estimation Techniques -Risk Management. Requirements Analysis and Specification: Requirements Gathering and Analysis -Software Requirements Specification (SRS) Software Design: Cohesion and Coupling -Neat Arrangement - Software Design Approaches.

Overview of SA/SD Methodology - Structured Analysis - Data Flow Diagrams (DFDs).Object Modeling Using UML: Overview of Object-Oriented Concepts - UML Diagrams - User Interface Design. Testing: UNIT Testing - Black-Box Testing - White-Box Testing - Debugging -Integration Testing - System Testing. Software Reliability and Quality Management: Software Reliability - Statistical Testing -Software Quality - Software Quality Management System. Software Maintenance - Software Reverse Engineering - Software Reuse.

UNIT VIII

Programming Languages

C Programming : C fundamentals - Expressions - Statements - Operators - Library functions. Data input output functions - Flow of control - if, if-else, while, do-while, for loop, Nested control structures - Switch, break and continue, go to statements - Comma operator. Functions - Recursions. Storage Classes - Arrays - Structures - Unions - Bit wise operations. Pointers - Structures and Pointers - Files: Creating Processing, Opening and Closing a data file.

Object Oriented Programming: Principles of Object- Oriented Programming – Beginning with C++ - Tokens, Expressions and Control Structures – Functions in C++. Classes and Objects – Constructors and Destructors – New Operator – Operator Overloading and Type Conversions. Managing Console I/O Operations – Working with Files – Templates – Exception Handling. Standard Template Library – Manipulating Strings – Object Oriented Systems Development.

Programming in JAVA: An overview of Java Object Oriented Programming. Data types – Variables – Type conversion and casting – Strings – Arrays – Control Statements. Class Fundamentals – Introducing Methods – Constructors – Garbage collection -Overloading Methods – command line arguments. Inheritance Basics & Types - Method overriding – Dynamic Method Dispatch – Using Abstract class –Packages & Interface - Exception Handling - I/O & Applets - AWT Classes.

Computer Graphics

Overview of graphics Systems: Video Display Device - Refresh Cathode-Ray tubes Raster - Scan Displays Random - Scan Displays - Color CRT Monitors - Direct view Storage tubes Flat - Panel Displays Three - Dimensional Viewing Devices, Stereoscopic and Virtual - Reality Systems. Raster Scan Systems - Random-Scan Systems - Input devices – Voice Systems - Hard-Copy Devices - Line Drawing Algorithms -DDA Algorithms - Circle generating Algorithm Properties of Ellipses. Two Dimensional Geometric Transformation - Three Dimensional Concepts - Visible Surface Detection Methods.

Multimedia Systems

Multimedia Definition - Use Of Multimedia - Delivering Multimedia - Text: About Fonts and Faces - Using Text in Multimedia - Computers and Text - Font Editing and Design Tools - Hypermedia and Hypertext. Images – Sound – Animation – Video. Making Multimedia: The Stage of Multimedia Project - The Intangible Needs - The Hardware Needs - The Software Needs - An Authoring Systems Needs- Multimedia Production Team.

Theory of Computation

Introduction to formal proof – Additional forms of proof – Inductive proofs –Finite. Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite. Automata (NFA) – Finite Automata with Epsilon transitions. Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of Automata. Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Definition of the Pushdown automata – Languages of a Pushdown Automata – Equivalence of Pushdown automata and CFG– Deterministic Pushdown Automata. Normal forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM. A language that is not Recursively Enumerable (RE). An undecidable problem RE – Undecidable problems about Turing Machine – Post's Correspondence Problem – The classes P and NP.