

**COMPUTER SCIENCE & ENGINEERING / INFORMATION SCIENCE &
ENGINEERING
MODULE - I**

Total Marks: 100

Digital and Computer Fundamentals

10 Marks

Number Systems - Binary, octal, decimal and hexa-decimal, Conversion from different number systems to others, 1's complement and 2's complement, ASCII Code; *Logic gates* - OR, AND, NOT, NAND, NOR; *Combinational Circuits* - Half adder, Full adder, Encoder, Decimal-to-BCD encoder, Decoders, BCD-to-Seven Segment Decoder, Multiplexer, 4:1 mux and DeMultiplexer, 1:4 Demux; *Introduction to Computers & Computer Software* - Introduction, Characteristics of Computers, Evolution of Computers (abstract only), Generations of Computers, Classification, Computer System, Applications; *Software* : Software categories, Machine language, Assembly Language, High level language; *Peripherals & Memory* - Input devices and Output devices, Primary memory- RAM, ROM, Types of ROM, Secondary memory- Hard disk, Optical disk – DVD, Blue Ray.

Operating Systems

10 Marks

Process concept, Process scheduling, Operations on processes, Inter-process communication, Process Scheduling concepts, Scheduling criteria, Scheduling algorithms, Synchronization – Background, The critical section management and semaphores, Deadlocks- System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock, Swapping, Contiguous memory allocation, Paging, Structure of page table, Segmentation, Demand paging, Copy-on-write, Page replacement, Allocation of frames.

MODULE -II

Programming with C

20 Marks

Introduction: Variables and Identifiers, Built-in Data Types, Variable Definition, Declaration, C Key Words-Rules & Guidelines for Naming Variables, Constants and Literals, Precedence and Order of Evaluation, Simple assignment statement, Basic input/output statement, Conditions, Relational Operators, Logical Operator, if statement, if-else statement, nested if-else, if-else ladder, switch, break, continue, goto and Labels. Looping statements – while, do-while, for and nested for loop; *Functions* - Definition of Function, Standard Library of C functions, function prototype, Formal parameter list, Return Type, Function call, Block structure, passing arguments to a Function: call by value; *Array*– Definition, declaring an Array, Initializing an Array. One and two dimensional arrays, Declaring & Initialization of two dimensional arrays, Null terminated strings as array of characters, arrays as function arguments; *Strings* - Introduction, Declaring & Initializing string variables, Reading & writing strings from variables, String handling functions; *Pre-processors* - Introduction, Macro substitution, File inclusion; *Structures and Unions* - Definition, Structures variables, initialization, nested structure, arrays of structures, Unions, Concept of pointers, Declaring and initializing pointers, Accessing variables using pointers, Pointer arithmetic, Pointers and arrays, Pointers and character strings, Pointers and functions, Pointer as a function argument, Pointers to function, Pointers and structures., Dynamic memory allocation, Allocating a block of memory: malloc(), Allocating multiple blocks of memory: calloc(), Releasing the used space: free(), Altering the size of memory:

realloc(), Defining and opening a file, closing a file, Input / Output operations on files, Error handling during I/O operations, Random Access to files, Command line arguments

MODULE -III**Data Structures using C****10 Marks**

Types of data structures-Primitive & non – primitive data structures, The Stack- Definition and examples, Primitive Operations- Push and Pop, Applications of Stacks- Infix, Postfix and Prefix Expressions, Recursive definition, the queue and its sequential representation, Linked linear lists, Circular linked lists, doubly linked list.

Data Base Management System**10 Marks**

Characteristics of the database approach, Actors on the scene, Workers behind the scene, Advantages of using the DBMS Approach, Data Models, Schemas, and Instances, Database Languages and Interfaces, Classification of database Management System, Entity Types, Entity Sets, attributes and keys, Relation Types, Relationship Sets, roles and structural constraints, Weak Entity Types, ER Diagrams, naming, conventions and design issues, Relational Model concepts, Relational Model Constraints and relational database schemas, Update Operation, Transaction and Dealing with constraints violations, SQL: DML, DDL & DCL related commands, Normal forms based on primary keys, General Definition of second and third normal forms, Boyce-codd Normal form.

MODULE -IV**OOPs with JAVA****15 Marks**

Object oriented Paradigm, Basic Concepts of OOP, Benefits of OOP, Applications of OOP; Java Program Structure, Java Tokens, Java Statements, Implementing a Java Program, Java Virtual Machine, Command Line Arguments, Programming Style, Constants, Variables, Data Types, Scope of Variables, Symbolic Constants, Type Casting, Standard Default Values, Special Operators, Mathematical Functions, Labelled Loops (break & Continue) Operators and Expressions, Decision Making, Branching & Looping; Defining a Class, Fields Declaration, Methods Declaration, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods, *Inheritance*: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract Methods and Classes; Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interface Variables; Java API Packages, Using System Packages, Naming Conventions, Creating Packages, Accessing a Package, Using a Package, Adding a Class to a Package; Creating Threads, Extending the Thread Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the 'Runnable' Interface; Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch Statements, Using Finally Statement, Throwing Our Own Exceptions.

Design and Analysis of Algorithms**05 Marks**

What is an Algorithm? Fundamentals of Algorithmic problem solving, important problem types. Fundamental data structures, Analysis Framework, Measuring the input size, Units for measuring Running time, Orders of Growth, Worst-case, Best-case and Average-case efficiencies, Asymptotic Notations and Basic Efficiency classes, Informal Introduction, O-notation, Ω -notation, θ -notation, Introduction to Brute Force approach, Selection Sort and Bubble Sort, Sequential

search, Exhaustive Search- Travelling salesman Problem and Knapsack Problem, Depth First Search, Breadth First Search, Introduction to divide and conquer, Merge Sort, Quick Sort, Binary Search, Binary Tree traversals and related properties, Decrease-and-Conquer- Introduction, Insertion Sort, Topological Sorting.

MODULE -V**Computer Networks and Security****10 Marks**

Networks – Categories of networks, Internetwork – Internet and Protocols, Overview of Networking, Need for Networking, Hardware and Software components, Network Communication Standards, OSI Reference Model, TCP/IP Model, Overview of network topologies, Basic topologies- bus, ring, star, mesh and hybrid; LAN Cables – Co-axial, twisted pair, optical fibre, LAN connectors- co-axial cable, and twisted pair cable, optical fibre, LAN devices – repeaters, hubs, switches, NIC, WLANs; TCP/IP addressing scheme- Components of IP addressing, IP address classes. Computer security concepts, The OSI security architecture, Security attacks, Security services, Security mechanisms, Standards, Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Random and Pseudorandom Numbers, Stream Ciphers and RC4, Cipher Block Modes of Operation, Approaches to Message Authentication, Secure Hash Function, Message Authentication Codes, Public Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures.

Web Programming**10 Marks**

Introduction to HTML: Web site, Web Page, Types of Web Pages, Browsers and their types, Client –Server Model, Web –Server, Working of different types of Web Pages, General structure of a Web Page, Scripting languages, URL. Introduction to XML, The Syntax of XML, XML Document Structure, Document Type Definitions, Declaring Elements, Declaring Attributes, Declaring Entities, Internal & External DTDs, Namespaces, XML Schemas, Defining the Schema, Defining the Schema Instances. Origins and Uses of PHP: Overview, General Syntactic Characteristics, Primitives, Operations and Expressions, Variables, Integer Type, Double Type, String Type, Boolean Type, Arithmetic Operations & Expressions, String Operations, Scalar Type conversions, Output, Control statements, Relational Operators, Boolean Operators, Selection Statements, Loop statements, Arrays, Array Creation, Accessing array Elements, Functions for Dealing with Arrays, Functions, General Characteristics of Functions, Parameters, The scope of Variables, The Lifetime of Variables, Pattern Matching.