Computer Science

Paper I

(Research Methodology)

Problem solving using a computer: , Procedure, function, algorithms, basic algorithmic notions, writing algorithms, recursive and iterative techniques, Analysis of algorithm asymptotic complexity, Big O, Omega and Theta notations,

Design of Algorithm: Divide and conquer techniques, Greedy technique, Dynamic programming, Back tracking, Branch and Bound techniques, P and NP problem, Lower bound theory, NP hard problem.

Discrete mathematics: Truth tables, normal forms, theory of inference for statement calculus, predicate calculus, inference theory of predicate calculus, Functions, recursion, algebraic systems with one and two binary operations, Group, Lattice, Boolean Algebra, Graph.

Numerical techniques: Solution of Algebraic and Transcendental equations, Bisection method, Method of false position, Newton-Raphson method, Solution of simultaneous linear equations: Gauss elimination method, Gauss-Jordan method, Gauss-Seidal method, Gauss-Jacobi method, matrix manipulation, eigen value, eigen vector, vector space. Forward Interpolation, backward Interpolation general Interpolation, Probability theory, conditional probability, Bayes' theorem, normal, binomial, Poisson distribution.

Optimization techniques: Linear programming, Simplex Method, Integer Programming, Branch and Bound Method, Transportation problems, Assignment problems, Travelling salesman problem, Job sequencing, PERT/CPM.

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Paper II

(Computer Science)

C Programming: Control structures, Arrays, String handling, Functions, recursion, Structures, Array of structures, Unions, Pointers, Array of pointers, dynamic memory allocation, storage classes, file handling.

Data structures: Abstract data types, Stack, Queue, Circular queue, Deque, Priority queue, applications, single and double linked lists, Binary tree representation, traversals (Inorder, Preorder, Postorder), Representations of graphs, graph traversals (Depth first and Breadth first), searching and sorting techniques.

Logical Organization of computers: Logic Gates, Boolean Algebra, Combinational Circuits: Half and Full adders, parallel adders, Decoder, Multiplexer, Flip-flops, Register, Shift register, Sequential circuits, Register Transfers, Execution of complete instruction, Input-Output Organizations, DMA.

Computer Architecture: Register Transfer and Micro-operations, Bus and memory transfer, Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input-Output and Interrupt. Design of Basic Computer, Micro-Programmed Control, Memory Organization, Pipeline and Vector Processing,

Data base system: Data models, Data Abstraction, Data Independence, Codd rules, Relational Algebra and Relational calculus, SQL, Database Design, data dependencies, Normal forms, Query Processing, File Structures, Hashing, indexing, transaction processing, ACID Properties, Serializability, Concurrency control, lock-based and timestamp based protocols,

Operating Systems: OS services, File access & Allocation Methods, directory systems, CPU Scheduling, Memory management, paging and segmentation, Virtual Memory, page replacement techniques, Disk scheduling, Deadlock, Banker's algorithm, deadlock detection and recovery, IPC, Process synchronization, Critical Section, Mutual Exclusion, Semaphore.

Object Oriented Programming: OOPs concepts, Classes and objects, access specifiers, Constructors, destructors, Function overloading, friend function, friend class, Operator overloading, Inheritance, virtual base class, function overriding, Compile time and Run time polymorphism, this pointer, virtual functions, Exception Handling, Function & Class Templates.

Computer Networks: Network Hardware & software, OSI Reference Model, Error Detection and Correction, Data link Protocols, Channel Allocation, Internetworking Devices, Routing Algorithms, Congestion Control Algorithms, TCP/IP Protocol Suit, Transport Layer Services, Cryptography and Network security, DNS, SMTP, FTP, TELNET, SNMP, WWW and HTTP.

Software Engineering: Software Processes, Software Project Management, Requirements Engineering, Software Design, Cohesion and coupling, Software Verification and Validation, and Testing, Software Cost Estimation, COCOMO, Software Reliability, Software Quality Management, Configuration Management, Software Maintenance, trends in software development.

Data warehousing &Data mining: multidimensional data models, OLAP, ROLAP, and MOLAP knowledge discovery through data mining, Concept hierarchies, Mining association rules, Apriori algorithm, Classification techniques, clustering, k-Means and k-Medians, DBSCAN.

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