BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE, INDIA
PhD Entrance Test – 2020
SECTION-II: COMPUTER Engineering - 50 Marks

UNIT No.	Topics covered
UNIT I	Data Structure & Algorithm - Data structures - Stacks, queues, trees, graphs, binary search trees, heaps and priority queues, hash tables, Searching and sorting - Linear and binary search. Bubble sort, insertion sort, selection sort, merge sort, quick sort, heap sort, counting sort, Algorithm design techniques - Divide-and-conquer, greedy, and dynamic programming algorithms. Graph algorithms - Preorder, inorder and postorder traversal of trees, BFS and DFS, topological sort. Minimum spanning trees (Kruskal's and Prim's algorithms), Shortest path (Dijkstra and Floyd-Warshal algorithms). Representation of graphs.
UNIT II	Regular Expressions and Languages, Deterministic and Non deterministic Finite Automata - DFAs, NFAs and their equivalence with Regular Grammars and Regular Expressions, Converting NFA to DFA, DFAs, NFAs and their equivalence with Regular Grammars and Regular Expressions, Converting NFA to DFA. Grammar- Context Free Grammar, sentential form, parse tree, inference, derivation, parse tree, ambiguity in grammar and language, Automata Regular grammar- Definition, left linear, right linear grammar, FA to RG and RG to FA, Application of grammar, Turing machines (TMs): TM Model and conventions, Push Down Automata
UNIT III	Assemblers, Macro Processor: Loaders and Linkers, Compile and Go, General Loader Scheme, Absolute Loader Scheme, Phase Structure of Compiler, Lexical Analyzer: The Role of the Lexical Analyzer, Role of Parsers, Top Down Parsers, Recursive Descent Parser, Predictive Parser, LL(K) Parsers, Bottom Up Parsers, Semantic Analysis Overview of Operating System, Process, Thread, Scheduling, Types of Scheduling, Scheduling Algorithms, Concurrency: Mutual Exclusion and Synchronization, Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock detection, Memory Management & Virtual Memory
UNIT IV	Network Models, Layers in the OSI Model, TCP/IP Protocol suite, Layered Architecture & its protocol, Wireless WANs: Cellular Telephone and Satellite Networks, Wireless Sensor Network, Wireless LAN, PAN and MAN, Ad-Hoc Networks and Sensor Networks. Network Security, Cryptography, Symmetric Key and Public Key Algorithms., Hash Algorithms, Key Management: Generations, Distribution, Updation, Digital Certificate, Digital Signature, PKI.
UNIT V	Relational Databases – Architecture – Query Language – E- R Modeling – Normalization – Query Processing, Transaction Processing – Integrity and Security – Multimedia Data Structures – Queries for Multimedia Databases, Parallel Databases, Distributed Databases, Joins, SQL/PL-SQL, Data mining, OLAP, OLTP Software Engineering Process, Agile Development Process, Requirement Engineering, Requirement analysis, Agile Requirement, Software Design Instruction set architecture- instruction types, instruction formats, addressing

	modes. Control organization of a CPU, control and data paths, and register-transfer level specifications. Memory system - Concept of memory hierarchy, cache memory, cache performance, cache-main memory mapping. Input-output systems - Programmed I/O, Interrupt-driven I/O, polling and vectored interrupt, basic concept of DMA transfer.

Text Books/References:

1.	Goodrich, Tamassia, Goldwasser, ―Data Structures and Algorithms in C++‖, Wiley publication
2.	John C. martin, "Introduction to Language and Theory of Computation", TMH, Third Edition
3.	William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition,
4.	D.M. Dhamdhere, "Systems Programming and Operating Systems", Tata McGraw-Hill
5.	Andrew S. Tanenbaum, "Computer Networks", PHI, Fifth Edition
6.	Pressman, R. (2010), "Software Engineering: A Practitioner's Approach",7th Ed. Singapore:
7.	Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", 6th Edition, McGraw Hill
8.	Willaim Stallings, "Computer Security: Principles and Practices", Pearson Ed.

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