



## RAM KRISHNA DHARMARTH FOUNDATION UNIVERSITY, BHOPAL

### Ph.D Entrance Examination

### Subject: Computer Science and Engineering

### Syllabus

#### **Programming and Data Structures**

Programming in C, Recursion, Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

File structures: Fields, Records and files, Sequential, Direct, index-sequential and relative files. Hashing, Inverted lists and multi-lists.

#### **Computer Organization and Architecture**

Boolean algebra and Minimization of Boolean functions, Combinational Circuit Design, Sequential Circuit Design.

Hardwired and Micro-programmed processor design, Instruction formats, Addressing modes, memory types and organizations, Interfacing peripheral devices, Interrupts.

Microprocessor architecture, Instruction set and Programming (8085, P-III/P-IV), Microprocessor applications.

#### **Operating Systems**

Memory Management: Virtual memory, paging, fragmentation.

Concurrent Processing: Mutual exclusion, Critical regions, Semaphores.

Scheduling: CPU scheduling, I/O scheduling, resource scheduling, Deadlock and scheduling algorithms.

Banker's algorithm for deadlock handling.

#### **Algorithms and Analysis**

Sorting and searching algorithms, Analysis of algorithms, Interpolation and Binary search, Asymptotic notations – big ohm, mega and theta, Average case analysis of simple programs like

finding of a maximum of  $n$  elements, Recursion and its systematic removal, Quick sort non-recursive implementation with minimal stack storage.

Design of Algorithms (Divide and Conquer, Greedy method, Dynamic programming, Back tracking, Branch and Bound), Lower bound theory, nondeterministic algorithm,-non-deterministic programming constructs, NP-hard and NP-complete problems.

### **Theory of Computation**

Models of computation-Finite Automata, Pushdown Automata, Nondeterministic and NFA, DPDA and PDAs and Languages accepted by these structures.

Grammars, Languages, Non-computability and Examples of non-computable problems.

### **Computer Networks & Internet**

Concept of layering, LAN technologies (Ethernet), Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state), TCP/UDP and sockets, congestion control, Application layer protocols (DNS, SMTP, POP, FTP, HTTP), Basics of Wi-Fi.

Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.