



TEERTHANKER MAHAVEER UNIVERSITY

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Delhi Road, Moradabad (U.P.)

SYLLABUS FOR RESEARCH APTITUDE TEST IN COMPUTER SCIENCE & ENGINEERING

The syllabus for Research Aptitude Test (RAT) in Computer Science is divided in two parts viz. Part A & Part B described below:

PART – A

Part A of the RAT shall be designed to assess the research skills/aptitude of the candidate consisting of questions from the following areas:

- 1. Research Methodology:** meaning, characteristics, and ethical issues in research; types of research; research methods
- 2. Logical Reasoning:** arguments, deductive and inductive research; logical and Venn diagram; inferences; analogies.
- 3. Data Interpretation:** interpretation of data; mapping and analysis of data, tools for data analysis; quantitative and qualitative research.
- 4. General Awareness about Basic Science:** basic science up to the level of SSC.
- 5. Mathematical Reasoning:** number series, letter series, codes; relationships, classification.

PART – B

Part-B of RAT is designed to assess subject specific knowledge of the candidate covering the syllabus given as below:

Algorithm Design and Analysis

Elementary Data Structures, Greedy Method: Knapsack Problem, Job Sequencing with Deadlines, Optimal Merge Patterns; Dynamic Programming, Optimal Binary Search Trees, 0/1 Knapsack, Reliability Design, Traveling Salesperson Problem; Backtracking: 8 – Queens Problem, Sum of Subsets, Hamiltonian Cycles, Knapsack Problem; Basic Search and Traversal Techniques, Non- Deterministic Algorithm: Non-Deterministic Programming Constructs; NP-Hard and NP-Complete Problems.

Advanced Networking

Circuit Switching Networks : AT & T's Dynamic Routing Network, Routing in Telephone Network, Dynamic Non Hierarchical Routing, Trunk Status Map Routing, Real Time Network Routing, Dynamic Alternative Routing, Distributed Adaptive Dynamic Routing, Optimized Dynamic Routing; Packet Switching Networks: Distance Vector Routing-Link State Routing-Inter Domain Routing, Classless Inter- domain Routing, Interior Gateway Routing Protocols, Routing Information Protocol, High Speed Networks.

Theory of Computer Science

Introduction to Languages; Recursive Definitions; Regular Expressions; Finite Automata; Kleen'S Theorem; Non- Deterministic Finite Automata; Finite Automata with Output; Regular Languages; Pumping Lemma for Regular Languages; Non-Regular Languages; Context-Free Grammars; Regular Grammars; Chomsky's Normal Form: Adding a Pushdown Stack to FA, Push Down Automata; Context Free Languages (CFLs), Pumping Lemma for CFLs, Turing and Post Machines; Recursively Enumerable Languages; Context- Sensitive Grammar.

Software Engineering

Software Life Cycle Models, Software Project Planning, Software Risk Management; Software Design: Design Definition, Modularity, Strategy of Design, Function Oriented Design, IEEE Recommended Practice for Software Design Description, Object Oriented Design; Software Metrics: Software Metrics, Token Count, Software Reliability, Software Reliability Models, Capability Maturity Model; Software Testing, Testing Tools; Software Maintenance, Reverse Engineering, Software Re-engineering, Configuration Management.

Parallel and Distributed Computing

Introduction: Computational Demands of Modern Science, Advent of Practical Parallel Processing; PRAM Algorithms, Mapping and Scheduling, Parallel Algorithms, Graph Algorithms,. Introduction To Distributed Network Systems: LAN, WAN, NOS, DOS, Distributed File Servers, Distributed Real Time Systems, Client- server Computing; Procedure Call Mechanism and Message Passing.

Soft Computing

Fundamentals of ANN, ANN Terminologies, Models of ANN, Self Organizing Feature Maps. Fuzzy System, Fuzzy Composition, Fuzzy Rules: Takagi and Mamdani – Fuzzy Inference Systems: Fuzzification, Inference, Rulebase, Defuzzification. Genetic Algorithm (GA): Biological Terminology, Elements of GA: Encoding, Selection, Crossover, Mutation, Reinsertion, Theoretical Foundation: Schema, Fundamental Theorem of GA, Building Block Hypothesis.

Current Trends and Technologies

Mobile Computing : Mobile Connectivity, Cells, Framework, Wireless Delivery Technology and Switching Methods, Mobile Information Access Devices, Mobile Data Internetworking Standards, Mobile Computing Applications; Mobile Databases – Protocols, Scope, Tools and Technology. Security and Cryptography: Introduction to Security, Security Attacks, Services and Mechanisms, Data Encryption Standard, Advanced Encryption Standard, Public– key Cryptography and RSA, Message Authentication and Hash Functions, Hash and MAC Algorithms, Digital Signatures and Authentication Protocols; Network Security : Authentication Applications, Electronic Mail Security, IP Security, Web Security, Intruders, Malicious Software, Firewalls.