

Ph. D Written Test Format and Syllabus

Computer Applications, Faculty of Engineering

Ph.D. Admission Test Format

The written test consists of two parts.

1. **Part A:** Research Methodology 25 questions.
2. **Part B:** CA 25 questions

Part A: Research Methodology Syllabus

Research Fundamentals:

Meaning of research; objectives of research; characteristics of good research, Research problem: Identification, selection, and techniques for defining research problem, Research process, Research outcomes, Review of Literature, Hypothesis: Definition and Types

Types of Research:

Types of research, fundamental and applied research, qualitative and quantitative. Research Design: Types of research design – Exploratory, Descriptive, Casual Analytical

Sampling, Data Collection and analysis:

Types and sources of data: Primary and secondary, Methods of collecting data: questionnaire, interview, observation, case study, experiments etc., Sampling and sampling methods, characteristics of good sample, sampling techniques, Statistical Methods for Data Analysis: measures of central tendency and dispersion

Research Report:

Main body of report, abstract and keywords, Referencing styles and bibliography. Journal and author indexing

Ethics in Research:

Biasing: Definition and Types, Plagiarism -Definition and forms, IPR, copyright infringement, AI Generated Content

Part B: Computer Applications Syllabus

Computer Networks & Algorithms:

ISO/OSI stack, transmission media, data encoding, multiplexing, flow and error control, LAN technologies (Ethernet, token ring), network devices – switches, gateways, routers, ICMP, application layer protocols – SMTP, POP3, HTTP, DNS, FTP, Telnet, network security – basic concepts of public key and private key cryptography, digital signature, firewalls

Algorithms: Asymptotic notations, space and time complexity, Best, worst and average case analysis. Design: Greedy approach, Dynamic programming, Divide-and-conquer; Tree and graph traversals, spanning trees, shortest paths, Sorting, Searching. Basic concepts of complexity classes - P, NP, NP hard, NP complete.

Operating System:

OS Structure, multitasking, multiprogramming, multithreading, Process Management, CPU scheduling, Deadlocks. Inter-process Communication, Memory management, Virtual memory, Demand Paging and Page Replacement Algorithms. I/O and Device management.

Data Structures & Databases:

Definition, Arrays, Function, Recursion, Stacks, Queues, Linked Lists, Singly and Doubly linked list.

ER - model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures, Transactions and concurrency control.

Software Engineering:

System Development Life Cycles (SDLC): Steps. Waterfall model, Prototype Model, Spiral model. Software Metrics: Software Project Management, COCOMO Model. Design: System design, detailed design, function-oriented design, object-oriented design, user interface design. Coding and Testing:



Testing level metrics. Software quality and reliability, software reengineering.

Introduction to C & C++:

C: Data types, Constants and Variables, Operators, Expressions and Control Structures. arrays. Pointers. String, Standard and User defined Function, Recursion. Structures and Union, Enumerations, Pre-Processors directives, File Handling.

C++: Structures, Function Overloading, Default Parameters, Inline Functions. Class and Objects, Constructors, destructors, dynamic memory allocation, Inheritance, Polymorphism, friend function, Templates.