Ph. D Written Test Format and Syllabus

Computer Science and Engineering, 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**: CSE	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 Science and Engineering Syllabus

Computer Organization and Architecture:

Logic functions, minimization, design and synthesis of combinatorial and sequential circuits, number representation and computer arithmetic. Machine instructions and addressing modes, ALU and data path, hardwired and micro programmed control, memory interface, I/O interface, serial communication interface, instruction pipelining, cache, main and secondary storage.

Computer Networks:

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.

Theory of Computation and Compiler Design:

Regular languages and finite automata, Context free languages and push down automata, recursively enumerable sets and Turing machines, Undesirability.

Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Intermediate and target code generation, Basics of code optimization.

Algorithms:

Analysis, Asymptotic notation, Notions of space and time complexity, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and-conquer; Tree and graph traversals, connected components, spanning trees, shortest paths; Hashing, Sorting, Searching. Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concepts of complexity classes - P, NP, NP hard, NP complete.

Operating System and Databases:

Operating System Structure, services and components, multitasking, multiprogramming, time sharing, multithreading, Process Management, CPU scheduling, Deadlocks. Inter-process Communication, Concurrent Processing and concurrency control, Memory management, Virtual memory, Demand Paging and Page Replacement Algorithms. I/O and Device management, buffering and spooling file management, file storage, Access methods and free space management.

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