

Syllabus for Ph.D. Admission test 2021-22: Dept. of Computer Sc. &Engg.

Part 1: Research Methodology

Section A:

30 Marks

Research methodology objectives; distinct approaches - descriptive, analytical, quantitative, qualitative, applied vs fundamental research; Research processes.

Different ways of benchmarking performance.

Mathematical Theory of Probability: Basic concepts, Classical and axiomatic approaches, Sample space and events, Properties of probability functions.

Conditional probability and independent events, Concept of random variable, Discrete and continuous probability density, mass and distribution functions.

Expectations and moments, Moment generating and characteristic functions, binomial and normal distributions.

Suggested Readings:

- "Research Methodology: Methods and Techniques" by C. R. Kothari
- Higher Engineering Mathematics by B.S Grewal, Khanna Publishers, 42nd Edition.
- Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, Academic Press, 4th Edition.
- A Modern Introduction to Probability and Statistics- Understanding Why and How by F.M. Dekking, C. Kraaikamp, H. P. Lopuhaä, L.E. Meester, Springer Publisher.

Section-B:

20 Marks

Writing as per conventions showing control of grammar, spelling, word usage, syntax, and punctuation; use of appropriate tone, style, and diction; uses appropriate formatting, media, design, and documentation of sources.

Useful moves for entering into and maintaining professional relationships through writing, which include writing memorandums, formal letters, application letters, cover letters and resumes.

Technical Communication Strategies and Researched Report Writing including origin of writing, scientific article writing, preparation of a short summary, writing introduction and/or conclusion for a given text.

International English Style; Principles of Simplicity, Clarity, Correspondence and Cultural Adaptation.

Suggested Readings:

- Technical Communication by Markel, Mike, 10th Edition Boston: Bedford/St. Martin's, 2010.
- The Chicago Guide to Communicating Science: Second Edition by Scott L. Montgomery, University of Chicago Press.

- Anderson, Paul V. (2011). Technical Communication: A ReaderCentered Approach. 7th ed. Wadsworth: Boston.
- How To Write and Publish a Scientific Paper, Robert A. DayFifth Edition, Oryx Press, Phoenix, AZ, 1998.
- The Elements of International English Style: A Guide to Writing Correspondence, Reports, Technical Documents, and Internet Pages for a Global Audience by Edmond H. Weiss, 1st Edition, M.E. Sharpe, Inc.

Part 2: Subjects in Computer Science and Engineering.

Module 1 is compulsory (carrying 20 marks)		
Module 1	a.	<i>Programming in C.</i>
	b.	<i>Data Structure: Array, Stack, Queue, Linked list, Tree, Binary Tree, Binary search tree.</i>
One can attempt any three modules from the following (each module carrying 10 marks)		
Module 2	a.	<i>Basic Electronics and Circuit Theory: Diode, Bipolar junction transistor, FET, Amplifier circuits, Kirchhoff's law, Thevenin's Theorem, Norton's Theorem, RC, LR, LCR circuits.</i>
	b.	<i>Digital Logic: Logic gates, Combinational circuits (Decoder, Encoder, Multiplexer), Minimization, Flip-Flops, Counters.</i>
Module 3	a.	<i>Mathematics: Functions, First order derivative, Set theory, Permutation and Combination.</i>
	b.	<i>Numerical methods: Solution of non-linear equation, Solution of linear simultaneous equations.</i>
Module 4	a.	<i>Microprocessor (8085): Instruction set and addressing modes, ALU, Data-path, and Control unit.</i>
	b.	<i>Computer organization: Design, Control Unit Design (Micro-programmed and Hardwired control units), Interrupt handling.</i>
Module 5	a.	<i>Data Communication and Network: OSI model, Modulation and Encoding, Flow control, Error control at Data Link Layer, IP addressing & subnet masking, Routing algorithms (Link State and Distance Vector algorithms).</i>
Module 6	a.	<i>Operating System: Memory management (Paging, Segmentation, Virtual memory management), Process management (PCB, Scheduling algorithms such as FCFS, RR), Inter Process Communication (PIPE-FIFO, Semaphore, Shared memory).</i>

Module 7	a.	<i>DBMS: E-R Diagram, Relational model, Functional Dependency and Normalization.</i>
Module 8	a.	<i>Formal Language and Automata: DFA, NFA, Regular expression, Context-free grammar and Pushdown automata.</i>
	b.	<i>Compiler: LL parsing, Intermediate code generation.</i>