Program	Ph.D.
Syllabus	Entrance Exam Syllabus for Computer Science and Engineering
Examination Pattern	

Question Type	No. of Questions	Total Marks
1 Mark Domain Specific	35	35
1 Mark Research Aptitude	35	35
Total	**70**	**70**

Section – 1 - Weightage – 50%	
Sr. No.	**Topics**
1	**Computer Organization and Architecture** - Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).
2	**Programming and Data Structures** - The basic concepts of programming in C, C++, Java. Decision, iteration, function or method call, recursion, Basic notions of space and time complexity, Parameter passing mechanism, scope, binding, Arrays, lists, stacks, queues, binary tree, binary search tree, Basics of searching and sorting, Graph and its representation.
3	**Algorithms** - Searching, sorting, hashing. Asymptotic worst-case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide and conquer. Graph search, minimum spanning trees, and shortest paths.
4	**TOC & Compiler Design** - Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and context-free languages, Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation.
5	**Operating System** - Processes, threads, inter process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems, I/O systems, Protection and security.
6	**Database Management System** - ER-model, Relational model, relation model, relational algebra, tuple calculus, Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.
7	**Computer Networks** - 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.
8	**Information Systems and Software Engineering** - Information gathering, requirement and feasibility analysis, data flow diagrams, UML diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.
9	**AI & Machine Learning** - Knowledge Representation and organization, Search and Control Strategies, Fuzzy Logic, Genetic algorithm, Expert System Architecture, Artificial Neural Network, Basics of Machine Learning and ML Algorithms.

10	**Basic Mathematics** Probability: Conditional Probability, Mean, Median, Mode and Standard Deviation, Random Variables, Distributions, uniform, normal, exponential, Poisson, Binomial. Set Theory & Algebra: Sets, Set operations, Relations, Functions, Groups, Partial Orders, Boolean algebra. Combinatory: Permutations; Combinations; principle of exclusion and inclusion, pigeon-hole principle, Summation; generating functions; recurrence relations, sum and product rule.

Section – 2 - Weightage – 50%	
Sr. No.	**Topics**
1	**Research Aptitude -** Research: Meaning, characteristics and types; Steps of research, Methods of research; Research Ethics; Paper, article, workshop, seminar, conference and symposium.
2	**Reasoning (Including Mathematical) -** Number series; letter series; codes; Relationships; classification.
3	**Logical Reasoning -** Understanding the structure of arguments; Evaluating and distinguishing deductive and inductive reasoning; Verbal analogies: Word Analogy-Applied analogy; Reasoning Logical Diagrams: Simple diagrammatic relationship, multi-diagrammatic relationship; Venn diagram; Analytical Reasoning
4	**Data Interpretation -** Sources, acquisition and interpretation of data; Quantitative and qualitative data; Graphical representation and mapping of data.