PhD Admission Test Syllabus
Department of Computer Engineering
2018-19

Digital Logic and Computer Architecture:

Boolean algebra, Combinational and sequential circuits Design and synthesis, Optimization. Number representations and computer arithmetic (fixed and floating point).

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).

Concepts of Data Structures & Algorithms, Software Engineering, and Computer Graphics:

Programming in C: Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs. Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: Greedy, dynamic programming and divide-and-conquer. Graph Algorithms.

Software Engineering Process Models, Metrics, Quality, Estimation, Basics of Computer Graphics, Transformations, projections, shading.

Theory of Computation:

Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and context-free languages, pumping lemma. Turing machines and undecidability.

Compiler Design and Operating System:

Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation. Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems.

Computer Networks:

Concept of layering. LAN technologies. Medium Access Control (MAC) layer protocols, Flow and Error control Techniques, Switching. Routers and routing algorithms (distance vector, link state). Transport Layer TCP/UDP, Principle of Reliable data Transfer, Congestion Control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Quality of service, Mobile and wireless networks. Internet of Things (IoT).

Data Analytics

Information Retrieval (IR), IR Models, Text Mining, Big Data, Web Mining, Machine Learning, Classification, Clustering, Association Rule Mining, Frequent Pattern Mining, Boosting, Ensembles, Deep Learning.

Artificial Intelligence:

Artificial Intelligence, Informed and Uninformed Search Knowledge Representation and Reasoning, First Order Logic, Inference in First Order Logic, Resolution, Reasoning with uncertain information, Expert System.

Computer Security:

Basic Cryptology: Cryptography and cryptanalysis, Application of cryptography: Network Security, system security and program security, Types of attacks. Digital signature key exchange and message authentication codes. User Authentication: Knowledge-Based Authentication, Token-Based Authentication, Biometric Authentication. Graphical Passwords.