Department of Computer Science & Engineering
GJUS&T, Hisar
Syllabus for PhD Entrance Examination

1. **Digital Logic, Computer Organization and Architecture:** Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point). Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage. Basics of microprocessors 8085, 8086. **(9 questions)**

2. **Data Structures & Algorithms:** Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps. 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, and NP-complete. **(9 questions)**

3. **Object Oriented Programming & Languages Programming:** Element of C, C++, Java -Tokens, Identifiers, Variable and constants, Data types, Control structure, Sequence selection and iteration, Structured data types in arrays, structure, union, string an pointers, Operator, O-O Programming concepts, Classes, Object, Inheritance, Polymorphism and overloading, Control Statement, Function parameter passing, Constructor and destructor, overloading inheritance temples , exception handling, templates. **(10 questions)**

4. **Theory of Computation & Compiler Design:** Regular languages and finite automata, Context free languages and Push-down automata, Recursively enumerable sets and Turing machines, Undecidability. Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Intermediate and target code generation, Basics of code optimization. **(9 questions)**

5. **Operating System:** Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, Memory management and virtual memory, File systems, I/O systems, Protection and security, Windows, Linux and Unix. **(9 questions)**

6. **Databases:** ER-model, Relational 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, Data Ware Housing, Data Mining. **(9 questions)**

7. **Information Systems and Software Engineering**: System development cycle(SDCL) information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance, Software Metrics, Software Project Management, Software Design. **(9 questions)**

8. **Computer Networks:** ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IP(v4), Application layer protocols (icmp, dns, smtp, pop, ftp, http); Basic concepts of hubs, switches, gateways, and routers. Network security basic concepts of public key and private key cryptography, digital signature, firewalls, Wireless networks. **(9 questions)**

9. **Internet & Web Technologies:** Scripting Languages, HTML, DHTML, JavaScript, Perl CGI, XML, basic concepts of client-server computing, Server side programming, Web Applications, Advanced Web Applications, Crawlers and Search Engines, Advanced Interactive Tools. **(9 questions)**

10. **Graphics & Multimedia:** Display system, input devise, 2D, geometry, Graphics operation, 3D Graphics, Visible surface detection methods, Animation Graphic Standard, Application concepts, Storage Devices, Input Tools, Authoring Tools, Application files, Multimedia Authoring & User Interface, Compression, Decompression, Applications of Computer Graphics & Multimedia. **(9 questions)**

11. **Artificial Intelligence:** Elements of symbolic logic- Propositional (Boolean)logic, Predicate Logic, Well-formed-formula, Deduction, Satisfiability and Tautology, Refutation method, Applications of Problem solving, State space representation of problems, Search Space representation of Problems, Search Technique, breadth-first, depth-first, A*, Knowledge Representation-Frame, script, semantic nets, production system, Fuzzy Systems-Definition Fuzzy set, Fuzzy logic, Fuzzy relation, Fuzzy Function, Fuzzy reasoning, Fuzzy Applications. **(9 questions)**

Chairman, PGBOS