Syllabus of Entrance Test for PhD (Information Technology)

Engineering Mathematics:- Discrete Mathematics: Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Monoids, Groups. Graphs: connectivity, matching, coloring. Combinatorics: counting, recurrence relations, generating functions.

Linear Algebra: Matrices, determinants, system of linear equations, eigenvalues and eigenvectors, LU decomposition.

Calculus: Limits, continuity and differentiability. Maxima and minima. Mean value theorem.

Integration. Probability and Statistics: Random variables. Uniform, normal, exponential, poison and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.

Digital Logic:- Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).

Computer Organization and Architecture:- Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining, pipeline hazards. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).

Programming and Data Structures:- Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs. Section 5: Algorithms Searching, sorting, hashing. Asymptotic worst-case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph traversals, minimum spanning trees, shortest paths.

Theory of Computation:- Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and contexfree languages, pumping lemma. Turing machines and undecidability.

Compiler Design:- Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation. Local optimization, Data flow analyses: constant propagation, liveness analysis, common subexpression elimination.

Operating System:- System calls, processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU and I/O scheduling. Memory management and virtual memory. File systems.

Databases:- ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

Computer Networks:- Concept of layering: OSI and TCP/IP Protocol Stacks; Basics of packet, circuit and virtual circuit-switching; Data link layer: framing, error detection, Medium Access Control, Ethernet bridging; Routing protocols: shortest path, flooding, distance vector and link state routing; Fragmentation and IP addressing, IPv4, CIDR notation, Basics of IP support protocols (ARP, DHCP, ICMP), Network Address Translation (NAT); Transport layer: flow control and congestion control, UDP, TCP, sockets; Application layer protocols: DNS, SMTP, HTTP, FTP, Email.

VRET- [redacted] Syllabus

Paper-I: Research Methodology

(Common for SoS of |Engineering & Technology)

Note: Each section carries equal weightage

Section-I:

Research: Meaning. Characteristics, types, steps, methods, and ethics, Paper, article, workshop, seminar, conference and symposium

Thesis writing: Its characteristics and format

Section-II:

Mathematical reasoning: Number series, letter series, codes, relationships, classifications and data representation

Section-III:

Logical reasoning: Understanding the structure of arguments. evaluating and distinguishing deductive and inductive reasoning. verbal analogies: Word and applied analog, verbal classification. reasoning logical diagrams, simple diagrammatic relationships. multi-diagrammatic relationships. Venn diagram and Analytical reasoning

Section-IV:

Environment Awareness: People and environment interaction: Source of pollution. Pollutant and their impact on human life. exploitation of natural and energy resources. Natural hazards and mitigation

Current issues of national and international importance relating to social, economic and industrial development.

Ethics and values in engineering profession

Section-V:

Reading comprehension: A passage to be set with objective questions

Information and Communication Technologies (ICT) based tools and their applications in Engineering such as networking, e-governance and technology based education