Faculty of Science
Aligarh Muslim University, Aligarh
Syllabus for Ph.D. Admission Test 2022 -23, Under Visvesvaraya Ph.D Scheme for Electronics and IT – Phase II

Section A

(Common to all Departments of the Faculty)

Research Aptitude/ Research Methodology

a) Logical Reasoning

b) Graphical Analysis

c) Analytical & Numerical Ability

d) Quantitative Comparisons

e) Series Formation

f) Puzzles etc

DEPARTMENT OF COMPUTER SCIENCE
FACULTY OF SCIENCE
A.M.U., ALIGARH

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Electronics and IT – Phase II

SECTION-B

Sets, Relations, Functions. Pigeonhole Principle, Indusion-Fxclusion Principle, Equivalence and Partial Orderings, Elementary Counting Techniques, Probability. Measure(s) for information and Mutual information. Computability: Models of eomputation-Finite Automata, Pushdown Automata, Nondeterminism and NFA. DPDA and PDAs and Eanguages accepted by these structures. Turing Machines, halting problem, Grammars, Languages, Non-computability and examples ofnon-computable problems. Compiler: Concepts, phases of compiler. YACC Compiler.

Graph: Definition, walks, paths, trails, connected graphs, regular and bipartite graphs, cycles and circuits. Tree and rooted tree. Spanning trees, Eccentricity ofa vertex radius and diameter ofa graph. Central Graphs. Centre(s) of a tree. Hamiltonian and Eulerian graphs, Planar graphs.

Propositional (Boolean) Logic, Predicate Logic, Well-formed-formulae (WFFL Satisfiability and Tautology. Logic Families :TTL, ECL and C-MOS gates. Boolean algebra and Minimization ofBoolean functions. Flip-flops: types, race condition and comparison. Design of combinational and sequential circuits. Representcition of Integers: Octal, Hex. Decimal, and Binary. 2's complement and Ls complement arithmetic, Addition, subtraction, multiplication and Division, Floating point representation and operations.

Data, Information, Definition of Data Structure, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps, Hashing, inverted lists and multi-lists, B tress and B+ trees.
Programming in *CJC++* : Identifiers, datatypes. Control structures. Sequence, selection and iteration(s). arrays, struct, union, string, and pointers. File handling, OOP Concepts.

Database Concepts: E-R diagrams and their transformation to relational design. Normalization-INF, 2NF, 3NF, BCNF and 4NF. Limitations of 4NF and BCNF.SQL: Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL) commands. Database objects like-Views, indexes, sequences, synonyms, data dictionary.

Big database: Big Data Processing Architectures, Big Data Technologies, Big Data Analysis, Big Data Analytics Software, Big Graph Search.

Soft Computing: Introduction to Soft Computing, Fuzzy Set Theory and Fuzzy logic Systems, Neural Networks, Genetic Algorithms & Modeling, Applications ofSoft Computing, Evolutionary Algorithms.

Data Mining: Data Mining Issues, Data Mining Techniques, Data mining Tools, Classification, Clustering, Data Mining Metrics.

Information Retrieval and Web mining: Web Mining, Data mining with unstructured data, Tex t mining, Tools and Techniques.

Parallel and Distributed Computing: Task partitioning and load balancing in parallel distributed computing, Advanced scheduling methods, dynamic task scheduling, and loop scheduling, Load balancing methods (deterministic and stochastic algorithms, optimality analysis, methods using co mb i natoria l opt i m i zat i on).

Information Systems: Use of Computers in Managerial applications, Technology issues and Data processing in organizations, Information systems, MIS and Decision making, System analysis and design, Internet and Internet-based applications, Advanced concepts of information system: Enterprise Resource Planning, the role ofERP systems in business processes, business intelligence tools.

E-Systems Engineering: Introduction to e-systems engineering, Eliciting Requirements and Analyzing needs, Modeling an Architecting System, Implementation, testing and Evaluation ofSystems.

Bioinformatics: Introduction to Bioinformatics: Introduction to Biological Databases: Biological D at a b ase s, I n fo rm a t i o n
Retrieval from Biological Databases, Machine Learning and Bioinformatics: Introduction to various Machine Learning techniques and their applications in Bioinformatics.

E-learning Systems: Model and Architecture of modern e-learning systems, Impact and challenges of e- learnmg

Software Engineering: Evolution of Software Engineering, Umbrella Activities, Software Project, Object oriented Modeling, Software Design, Software Metrics, Software Testing, Software Security, Softw are Security Testing Techniques.

Computer Networks: Network Models, Protocols & Protocol Suite, Routing, Congestion Control: QoS, Network Security, Data Communication Concepts and Technologies.

Wireless Sensor Networks: Introduction to Sensor Networks, unique constraints and challenges, Advantage ofSensor Networks, Applications ofSensor Networks, Mobile Adhoc NETworks (MANETs) and Wireless Sensor Networks (WSN), Enabling technologies for Wireless Sensor Networks, Sensor Node Elardware and Network Architecture, Deployment and Configuration of WSN, Routing and Security in WSN, Data Storage and Manipulation in WSN.

Cloud Computing: Recent trends in cloud computing, Enabling Technologies and System Models for Cloud Computing. Virtualization and load balancing in cloud computing, Game theory and Algorithmic Game theory. Approximation Algorithms.