

## Syllabus for VRET EXAM, GGV, 2018-19

### Department of Computer Science and Information Technology

#### Section A: Research Methodology (50%)

**General and Scientific Aptitude:** General Information of Science and Its interface with society to test the candidate's awareness of science aptitude of scientific and quantitative reasoning.

**Fundamentals of Computer:** Generations of Computer (I-V), Functions of the Different Units: Input unit Output unit, Memory unit, CPU (ALU+CU), Input & Output Devices Memories: Registers, Cache, Primary Memory, Secondary Memory Software: System Software, Application Software, MS Office: Understanding Word Processing, Using Spread Sheet, Making Presentations Introduction to Internet, WWW and Web Browsers, introduction to networks, E-mail, Number System: Decimal, Octal, Hexadecimal, Base conversions, Binary Codes: BCD.

**Statistics and Probability:** Frequency distribution, Measures of central tendency Probability: event, sample space, mutually exclusive, independent event, Permutation and Combinations, addition theorem, multiplication theorem, conditional probability, Baye's theorem, Random variables, Probability Distribution: Binomial, Poisson and Normal Distributions, Multivariate Analysis and Curve Fitting: Correlation, Correlation Coefficient, Rank Correlation, Linear Regression, Principles of Least Squares and Curve Fitting.

**Matrices:** Definition and examples, different type of matrices, Inverse of matrix, Rank of Matrix, Eigen values and Eigen vectors of matrix, Characteristic Equation, Crammer's Rule and Gauss Jordan method for the solution of Simultaneous equations.

**Discrete Mathematics:** Sets, Operations on sets, Relations and functions, Power set, Induced maps, Number system, The Peano's axioms, Cardinality of sets, Mathematical Induction; Statement Logic: Statement and Notations, Connectives, Conjunctive normal forms, Disjunctive normal forms, Statement Calculus, Lattices, Boolean algebra.

## **Section B: Core Subject: Computer Science (50%)**

### **Unit-I**

#### **Advanced Data Structure and Programming**

Data Structures, Linear and Non-linear Data Structures, Lists, Stacks, Queues, Graphs, Trees, Complexities, Hash Tables, Hash tables on disk, Files, Index file approach, Binary Trees, Trees vs. Binary Trees, Binary Search Trees, Storing Binary Trees as Disk files, Red-Black Trees, RAM based, Balanced vs. unbalanced trees, Rotations, Insertions, Deletions, 2-3-4 Trees and external storage (disk files), B Trees, Search, Insertion, Node splits, Heaps, Heap Sort Searching, Breadth-First, Depth-First, Minimum Spanning Trees, Weighted Graphs, Shortest path, Dijkstra's algorithm, Shortest path.

#### **Advanced DBMS and Big Data**

Database concepts, ER diagram, Data Models, Design of relational Database Normalization, SQL and QBE, Query processing and optimization, Centralised and distributed databases, Transaction Management concurrency and recovery in centralised and distributed database system, Object oriented Database Management Systems(concepts, Composite objects, Integration with RDBMS applications), ORACLE, Internet Applications, Database Security, Introduction to Big Data, MPP, Map Reduce programming.

### **Unit-II**

#### **Advanced Operating System**

Introduction to distributed operating systems, Hardware concepts of distributed systems, Software concepts and design issues, Communication in distributed systems, Synchronization in distributed systems, Process and processors in distributed systems, Distributed file systems, Distributed shared memory, Static and Dynamic load distribution, Deadlock problem in distributed systems, Routing algorithms, Threads and thread usage,

Multithreading operating system , Client – server model, Implementation of Client-server mode, Remote procedure call, Implementation of remote procedure call.

### **Computer Organization and Compilers**

Data Representation and Digital Components, Basics of computer organization and design, Principles Of Computer Design, CPU & Control Unit, Computer Arithmetic, Memory System & Multiprocessor, Parallel processing, pipelining, Input output processing, Finite Automata, Formal Languages, Introduction to Compiling, Phases of Compiler, Lexical Analysis, Syntax Analysis, Syntax Directed Analysis, Type Checking, Run time Environments, Intermediate Code Generation, Code Generation and Code Optimization

### **Unit-III**

#### **Computer Networks**

Introduction and Overview, Application Layer, Data Encoding and Transmission, Data Link Control, Transport Layer, Network Layer, IP Multicast, Multimedia Networking, Network Management, Network devices, Advanced concept in network, Wireless and mobile ad-hoc network, Network Clouds, Cloud Storage, Cloud services, Fog Computing.

#### **Network Security**

Basic Cryptography, Secret Key Cryptography, Public Key Cryptography, symmetric and asymmetric cryptography, authentication, security policy, Trusted Intermediaries, Real-time Communication Security, Electronic Mail Security, Firewalls and Web Security, LAN security, Intruders and Viruses, Firewalls, Intrusion Detection, Router and switch architectures, internet policy routing, Security Features in Operating System, Database Security, Biometric Security, Light Weight Cryptography, Security in Mobile Networks.

## **Internet and Web Technologies:**

Introduction to Internet, TCP/IP-Internet technology and protocol, Internet connectivity, Internet network, Services on internet, Electronic mail, Current trends on Internet. Web publishing and browsing, Social Media Networks, HTML programming, API, ASP and JSP, Interactive tools, Information Privacy and Copyright Issues, Semantic Web stack concepts, Ontology, XML programming, Expert Systems vs Semantic Web, Social Media Network Applications.

### **Unit-IV**

#### **Data Mining and Predictive Analytics**

Introduction to Data Mining, Data Warehouse and OLAP, Data pre-processing, Dimensionality reduction, Feature selection and feature extraction, Data mining knowledge representation, Types of advanced databases, Association rules, Data Classification, Clustering, Prediction, Mining real data, Ensemble models, Performance analysis, Principle component analysis, Factor analysis, Independent component analysis, Advanced techniques, Web mining, Applications and trends in Data Mining.

### **Unit-V**

#### **AI and Machine Learning**

Introduction to AI, Problem formulation, Search algorithm, production system, Propositional logic, First order predicate logic, Knowledge representation, Semantic nets, Conceptual Dependency representation, Frames and Scripts, Decision tree, Expert Systems, Rule Based Expert Systems, Black Board Architecture, Dash Boards, Natural Language Processing, Machine Learning, Supervised and Unsupervised learning, Instance based learning, reinforcement learning, Pattern recognition, Feature selection, Feature transform, Decision based algorithm, Decision tree, Optimization algorithms: Genetic algorithm, Differential evolution, Ant colony optimization, Particle swarm optimization, Cat optimization, ABC Algorithm.

## **Soft Computing and Neural Networks**

Perception model, linear separability and XOR problem. Two and three layered neural networks, feed forward and feed backward networks, Backpropagation-Convergence, Hopfield nets, Neural net learning, Radial basis function network, Kohonen Self-Organising Map Applications. Support Vector Machine, SVM Algorithm, Fuzzy set, Fuzzy relations, Fuzzy functions, Fuzzy measures, Fuzzy reasoning, and Applications of Fuzzy systems.