CA	Computer Applications Syllabus for QT-RA

Mathematics Section

SYLLABUS IN MATHEMATICS

1. **Matrices :** Definition, Rank of matrix Systems of m linear equations with n unknown, Eigen value and eigen vectors of a square matrix.
3. **Vector Algebra; Complex numbers;** Definitions, Vector products , Properties; Amplitude & Modules of a complex number, De Moivere's theorem and examples.
4. **Applied Mathematics -** Laplace Transforms (Elementary transformation), Fourier series, (Basics definition and examples.) , half range Fourier series and harmonic analysis.
5. **Numerical Analysis** – Numerical Solutions of Algebraic and transcendental equations, Finite differences , Interpolation (For equal and unequal intervals) Numerical solutions of first order differential equations , Numerical Integration
6. **Statistics and Probability**

   Measures of central tendency and dispersion curve fitting by least square methods . Correlation and regression. analysis

   Probability : Axiams , conditional probability, probability distribution-Binomial poisson and normal distribution

TEXTBOOKS:

1. Higher Engineering Mathematics – Dr. B.S. Grewal (37th Edition)
2. Elementary Engineering Mathematics- Dr. B.S. Grewal
3. Advanced Engineering Mathematics –Erwin Kreyszig
4. Introduction to Numerical Analysis –S.S. Sastry

Part II: ***Discipline Oriented Section***

Sl. No	Topics
1.	**Computer Organization** **Basic Structure of Computers:** Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Performance –Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement, Historical Perspective.
2.	**Data Structures using C** (Stack, recursion, Queues and lists, Trees, sorting, searching)
3.	**Operating systems** **Introduction to Operating Systems, System structures:** What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special-purpose systems; Computing environments.Operating System Services; User - Operating System interface; System calls; Types of system calls; System program s; Operating System design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.
4.	**OOP with C++** **Introduction:** Overview of C++, Sample C++ program, Different data types, operators, expressions, and statements, arrays and strings, pointers & user-defined types Function Components, argument passing, inline functions, function overloading, recursive functions **Classes & Objects – I:** Class Specification, Class Objects, Scope resolution operator, Access members, Defining member functions , Data hiding, Constructors, Destructors, Parameterized constructors, Static data members, Functions **Classes & Objects –II:** Friend functions, Passing objects as arguments, Returning objects, Arrays of objects, Dynamic objects, Pointers to objects, Copy constructors, Generic functions and classes, Applications Operator overloading using friend functions such as +, - , pre-increment, post-increment **Inheritance – I:** Base Class, Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes **Inheritance – II:** Constructors, Destructors and Inheritance, Passing parameters to base class constructors, Granting access, Virtual base classes **Virtual functions, Polymorphism:** Virtual function, Calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, Pure virtual functions, Abstract classes, Using virtual functions, Early and late binding. **I/O System Basics, File I/0:** C++ stream classes, Formatted I/O, I/O manipulators, fstream and the File classes, File operations **Exception Handling, STL:** Exception handling fundamentals, Exception handling options STL: An overview, containers, vectors, lists, maps.
5.	**DBMS** **Introduction:** Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems. **Entity-Relationship Model:** Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and

	Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two. **Relational Model and Relational Algebra :** Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update 38 Operations, Transactions and dealing with constrain t violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Opera tions : JOIN and DIVISION; Additional Relational Operations; Example s of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping. **SQL – 1:** SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries.
6.	**Analysis & Design of Algorithms** **Introduction:** Notion of Algorithm, Review of Asymptotic Notations , Mathematical Analysis of Non-Recursive and Recursive Algorithms Brute Force Approaches: Introduction, Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching. **Divide and Conquer:** Divide and Conquer: General Method, Defective Chess Board, Binary Search, Merge Sort, Quick Sort and its performance. **The Greedy Method:** The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm; Single Source Shortest Paths. **Dynamic Programming:** The General Method, Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths Problem, Single-Source Shortest Paths: General Weights, 0/1 Knapsack, The Traveling Salesperson problem.

TEXTBOOKS:

1. William Stallings: Computer Organization & Architecture, 7th Edition, PHI, 2006.
2. Yedidyah, Augenstein, Tannenbaum: Data Structures Using C and C++, 2nd Edition, Pearson Education, 2003
3. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating System Principles, 8th edition, Wiley India, 2009.
4. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.
5. Elmasri and Navathe: Fundamentals of Database Systems,5th Edition, Pearson Education, 2007.
6. Anany Levitin: Introduction to The Design & Analysis of Algorithms, 2nd Edition, Pearson Education, 2007.(Listed topics only from the Chapters 1, 2, 3, 5, 7, 8, 10, 11).