

# **Rajasthan Public Service Commission, Ajmer**

## **RAJASTHAN STATE AND SUBORDINATE SERVICES COMBINED COMPETITIVE EXAMINATION**

### **SYLLABI OF THE PAPER/SUBJECTS PRESCRIBED FOR THE MAIN EXAMINATION**

#### **OPTIONAL SUBJECT**

#### **COMPUTER ENGINEERING      PAPER-I    (Code No. 09)**

##### **I. Digital Electronics**

Introduction to number System and their conversions. Arithmetic with bases other than ten. Boolean Algebra and Simplification of Boolean expressions. Standard form of boolean functions, Minterm Maxterm designation of functions, Combinational Circuits. Introduction to switching devices, positive and negative logic of OR, AND, NOR, NAND, Exclusive OR, and Exclusive NOR gates, IC digital logic families. Simplification of function by karnaugh maps. Quine McCluskey tabular methods for simplification of Boolean function and determination of prime implicants. Selection of an optimal set of prime implicants, multiple output circuits and map minimization of multiple output circuits;. General characteristics of sequential circuits. Clock, puls and level mode sequential circuits. Analysis and design of a sequential circuit.

##### **II. Programming Languages**

Structured programming and object oriented programming. Abstraction, encapsulation, data hiding, Polymorphism, Scope rules, Parameter passing, run time environment, Static and dynamic storage management, garbage collection, exception handling, task and concurrency in programming language like C, C++. JAVA. Concepts of 4GL

##### **III. Data Structure And Algorithms**

Elementary and structured data types, Linear Structures: Arrays and Records, Stacks, Queues and Linked Lists, Strings Prefix, Postfix, infix expressions. Non linear structures: generalized linked list, trees, graphs and their traversals, trie and dictionary. Built in Data structures such as Records, Files Sets, Graphs and Pointers. Recursion, Sorting-Internal and External, Searching, Hashing, Symbol Tables. Problem solving and algorithms development and analysis.

#### IV. Computer Architecture

Processor Organization, Instruction fetch and execution cycles, information representation, Number formats and their representation in memory. Common addressing techniques, instruction types, Arithmetic operations and their implementations. Memories : types, characteristics and organization. System modeling, Design levels. Register level design, Description language, Processor level design, Design Techniques. Instruction Sequencing and interpretation hardwired controls and its implementation concepts, microprogrammed control Conventional and unconventional microprogrammed control computers.

#### V. Data Base Management System

Need, Purpose and Goals of DBMS. Physical and Logical data bases, data abstraction and data independence, data aggregation, data models: ER and object Oriented Models, Introduction to relational model, relation algebra, theory of normalization. SQL. Physical data organization in sequential, Indexed, Random and Hashed files. Inverted and multilist structures, B+ Trees. Transaction processing, concurrency control, recovery management and database security, Transaction model properties and state serializability, Lock based protocols. Deadlock prevention and detection. Introduction to Distributed DBMS

### **COMPUTER ENGINEERING      PAPER-II    (Code No. 09)**

#### I. System Programming and Operating System

Concept of machines and assembly language programming, representation of instruction and data, assemblers, and macro assemblers. Introduction to Operating System, Operating System Services and Kernel. Multiprogramming & Time Sharing, Memory Management, Paging and Segmenting, Input Output and Device Management, Disk and File Management. Deadlocks and concurrent processes. Protection and security, Introduction to multiprocessors and distributed operating systems. Case studies of UNIX and WINDOWS operating systems.

#### II. Theory of Computation and Compiler Design

Introduction to Automata Theory, Language, regular expression, finite automata, transition graph, non-determinism, Push Down Automata Theory, context free grammars, trees, regular grammars, context-free languages.

Introduction to compilers, translators and interpreters, compilation process. Lexical and Syntactical analysis. Top Down and Bottom up parsing, syntax directed translation. Symbol tables organizations : Hashing, Linked List, Tree structures. Code generation : Compilation of expressions and control structures. Error detection and recovery. Code optimization : Optimizing transformation, local and global optimization.

### III. Computer Networks

Data communication Fundamentals, Computer Network, Architecture, Packet and circuit switching. Functions and working of OSI layers. Satellite and packet radio network. Local area network. Internetworking and ISDN/B-ISDN. Network Protocols: Ethernet, TCP/IP. Network management and Interoperability. Performance issues of LAN and WAN.

### IV. Software Engineering

Introduction to Software Engineering, Requirement Engineering, Structural System Design, Data Oriented analysis and Design, Object Oriented Analysis and Design, Software Quality Assurance. User interface design, Software complexity and reliability. Software project management.

### V. Computer Graphics

Introduction to interactive computer graphics, picture analysis overview of programmer's model of interactive graphics. Fundamental problems in geometry. Basic Raster Graphics: Scan Conversion, filling and clipping. Geometric manipulations : Transformation, Matrices and homogeneous coordinates. Elementary 3-D graphics, plane projections, vanishing points, specification of 3-D view. Visibility, image and object precision, z-buffer algorithms, area based algorithms, floating horizon. Curves and surfaces: parametric representation, Bezier and B-spline curves. Rendering: Ray tracing, antialiasing, Gourard and Phong Shading.

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