

**DETAILED SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR IN  
COMPUTER SCIENCE AND ENGINEERING**

(Cat.No. : 723/2021)

(Total Marks- 100)

**Module I : MATHEMATICS for CSE (20 Marks)**

**Linear Algebra:** Matrices, Rank, system of linear equations, consistency, eigen values, eigen vectors, Cayley Hamilton theorem, diagonalisation, linear dependence and independence of vectors.

**Basics of mathematical logic:** Basic connectives and truth table, statements, logical connectives, tautology, contradiction. logical equivalence, principle of duality, implication, contrapositive, converse, inverse.

**Counting Theory:** Rule of sum, rule of product, permutations. combinations, binomial theorem, combination with repetition, Pigeon hole principle, principle of inclusion and exclusion.

**Sets, Relations and Functions:** Sets, relations, different types of relations, functions, different types of functions.

**Algebraic Structures:** Homomorphism, isomorphism, semi groups, monoids, groups, commutative groups, sub groups, Lagrange's theorem, rings, fields. vector spaces.

**Graph Theory:** Graphs, subgraph, connectivity, independence sets, cliques, bipartite graphs, vertex cover, vertex colouring, planar graphs, graph representations.

**Module II : Computer Organization & Architecture (15 Marks)**

**Digital Logic:** Number representations and computer arithmetic (fixed and floating point), logic functions, minimization, design and synthesis of combinational and sequential circuits. State Machines.

**Computer Organization:** Machine instructions and addressing modes, control design, memory interface, I/O interface, DMA, interrupts, pipelining, memory hierarchy - cache memory.

**Module III : Programming Languages & Database(25 Marks)**

**Programming in C:** Data types, operators, type conversions, control statements, user defined functions, arrays, pointers, structure and union, file operations.

**Object Oriented Programming Concepts:** classes and objects, data abstraction, data hiding, data encapsulation, inheritance, polymorphism, abstract classes, interfaces, packages.

**Programming Language Concepts:** Parameter passing, binding, scope, recursion, imperative, declarative, functional and logic languages.

**Databases:** ER model, relational algebra, tuple calculus, database design, integrity constraints, normalization, SQL, transactions and concurrency control.

#### **Module IV : Theoretical Computer Science( 25 Marks)**

**Data Structures and Algorithms:** Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs, searching and sorting algorithms.

**Analysis and Design of Algorithms:** Analysis - space and time complexity, Asymptotic Notations, Design strategies - divide-and-conquer, greedy, dynamic programming, branch and bound, complexity classes - P, NP, NP-hard, NP-complete.

**Theory of Computation:** Representation of regular languages -finite automata, regular expression, regular grammar, closure properties of regular languages, Existence of non regular languages, Representation of context-free languages - pushdown automata and context free grammar, closure properties of context free languages, Context sensitive languages, recursively enumerable and recursive languages, Turing machines, undecidability of Turing machines.

**Language Translators:** Compiler design, lexical analysis, parsing, syntax directed translation, code generation and optimization, assemblers, linkers and loaders, macroprocessors.

#### **Module V : Operating Systems and Computer Networks( 15 Marks)**

**Operating System:** processes, threads, inter-process communication, synchronization, deadlocks, CPU scheduling, memory management and virtual memory, file systems, I/O systems, protection & security.

**Computer Networks:** ISO/OSI reference model, TCP/IP model, flow control, error control, IPV4 header format, IPV4 addressing, IPV6 header format, routing algorithms, congestion control, connection oriented and connectionless protocols in the transport layer, application layer protocols, network devices,

<b>Sl. No</b>	<b>Topic/Module</b>	<b>Marks distribution</b>
1	<i>Module I : MATHEMATICS for CSE</i>	20
2	<i>Module II : Computer Organization &amp; Architecture</i>	15
3	<i>Module III : Programming Languages &amp; Database</i>	25
4	<i>Module IV : Theoretical Computer Science</i>	25
5	<i>Module V : Operating Systems and Computer Networks</i>	15
<b>Total marks</b>		<b>100</b>

**NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper**