Syllabus for the Recruitment Test for the post of

Assistant Professor (College Cadre) in the subject of

Computer

UNIT - I

Representation of Numbers : Octal, Hexadecimal, Decimal and Binary. 2′s complement and 1′s complement arithmetic. Floating-point representation of numbers.

Logic Families : Boolean algebra and Minimization of Boolean functions. Predicate Logic, Well-formed-formulae (WFF), Satisfiability and Tautology.

Sequential Circuits: Flip-flops – types, race condition and comparison, registers, counters.

Combinational Circuits: adders, subtractors, multiplexer, demultiplexers, encoder, decoder, code converters.

CPU Organization: types, control unit – hardwired and micro-programmed, instruction formats, addressing modes, CPU registers, instruction cycle.

Memory Organization: Memory types and organizations, interfacing peripheral devices, interrupts.

UNIT – II

Programming Languages: Concepts, paradigms and models, dynamic binding, reference semantics and their implementation

Programming in C: Elements of C – Tokens, identifiers, data types in C; Operators, Expressions, Control structures - sequence, selection and iteration(s). Structured data types in C-arrays, struct, union, string and pointers, I/O Statements, User – defined and built – in functions, Parameter passing, data files.

Object Oriented Programming: Elements of C++ – Tokens, identifiers. Variables and constants, Data types, Operators, Control statements. Functions parameter passing. Classes & objects. Constructors and destructors. Overloading of operators & functions, Inheritance, Templates, Exception handling.

UNIT – III

Relational Database Design: Database Concepts, E-R diagrams and their transformation to relational design, normalization – INF, 2NF, 3NF, BCNF, 4NF, 5NF.

SQL : Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL) commands. Database objects like-Views, indexes, sequences, synonyms, data dictionary.

Query Processing and Optimization: Centralized and Distributed Database, Security, Concurrency and Recovery in Centralized and Distributed Database Systems, Object Oriented Database Management Systems (Concepts, Composite objects, Integration with RDBMS applications).

UNIT – IV

Data Structures: types – arrays, stacks, queues, linked lists, trees, priority queues and heaps, File Structures – Sequential, direct, index-sequential and relative files. Hashing, inverted lists, B trees and B+ trees.

Discrete Structures: Sets, Relations, Functions. Pigeonhole Principle, Inclusion-Exclusion Principle, Equivalence and Partial Orderings, Elementary Counting Techniques,

Graph: Definition, walks, paths, trails, connected graphs, regular and bipartite graphs, cycles and circuits. Tree and rooted tree. Spanning trees. Eccentricity of a vertex, radius and diameter of a graph. Center of tree. Hamiltonian and Eulerian graph, Planar graph.

Design and Analysis of Algorithms: Analysis of Algorithms, Asymptotic notations-big ohm, omega and theta; Searching Algorithms – linear & binary search, Sorting Algorithms – selection sort, bubble sort, insertion sort, merge sort & quick sort & heap sort - recursive and non – recursive implementations. Divide and Conquer, Greedy method, Dynamic programming, Back tracking, Branch and Bound. Lower bound theory, Non – deterministic algorithm, Non – deterministic programming constructs. Complexity classes-P, NP, NP-hard, NP-easy and NP-complete problems.

UNIT – V

Computer Networks : Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), Wireless Networks, Inter Networks, OSI Reference Models, switching techniques, Topologies, TCP / IP model.

Data Communication : Analog and Digital transmission, Asynchronous and Synchronous transmission, Channel capacity. Media-twisted pair, coaxial cables, fiber – optic cables, wireless transmission-radio, microwave, infrared. Telephones – local loop, trunks, multiplexing, switching, narrowband ISDN, broadband ISDN, ATM, High speed LANS. Cellular Radio. Communication satellites geo-synchronous and low-orbit.

Internetworking : Switch/Hub, Bridge, Router, Gateways, Concatenated virtual circuits, Tunnelling, Fragmentation, Firewalls.

Routing : Virtual circuits and datagrams. Routing algorithms. Congestion control.

Network Security : active & passive attacks, cryptography-public key, secret key.

UNIT – VI

System Programming: Assembly language fundamentals (8085 based assembly language programming). One pass & two-pass assemblers. Macros and macroprocessors, Loading, linking, relocation, program relocatability. Linkage editing, Text editors. Programming Environments. Debuggers and program generators.

Compiler Design: Compilation and Interpretation. Bootstrap compilers. Phases of compilation process. Lexical analysis. Parsing and parse trees. Representation of parse (derivation) trees as rightmost and leftmost derivations. Bottom up parsers-shift-reduce, operator precedence, and LR. Top-down parsers-left recursion and its removal. Recursive descent parser. Predictive parser. Intermediate codes-Quadruples, Triples, Intermediate code generation, Code optimization, Code generation.

UNIT – VII

Operating Systems: Main functions of operating systems. Types of OS - Multiprogramming, multiprocessing, multitasking, time sharing, real time, distributed operating system.

Memory Management : Virtual memory, paging, segmentation, fragmentation.

Concurrent Processing : Mutual exclusion. Critical regions, semaphores, lock and unlock.

Scheduling : CPU scheduling, I/O scheduling, Resource scheduling. Deadlock and scheduling algorithms. Banker's algorithm for deadlock handling.

Linux/Unix OS: Structure, file system, process management, bourne shell, shell variables, LEX and YACC, Shell programming. Filters and Commands – ps, cat, ls, head, tail, cut, paste, sort, uniq, tr, join, grep, egrep, fgrep, sed, awk, etc. System Calls - create, open, close, read, write, iseek, link, unlink, stat, fstat, umask, chmod, exec, fork, wait, system.

UNIT – VIII

Software Engineering: System Development Life Cycle (SDLC) Steps, Water fall model, Prototypes, Spiral model, Requirement analysis and specifications. Software Metrics, Software Project Management, Software Design - System design, detailed design, function oriented design, object oriented design, user interface design. Design level metrics, Coding and Testing - Testing level metrics. Software quality and reliability. Clean room approach, software re engineering. Programming techniques and tools, Software validation and quality assurance techniques, Software maintenance and advanced concepts, Software management.

Data Warehousing : environment, architecture of a data warehouse methodology, analysis, design, construction and administration.

Data Mining : Extracting models and patterns from large databases, data mining techniques, classification, regression, clustering, summarization, dependency modeling, link analysis, sequencing analysis, mining scientific and business data.

UNIT-IX

Computer Graphics: Display systems, Input devices, 2D Geometry, Graphic operations, 3D Graphics, Animation, Graphic standard, Applications, Storage Devices, Input Tools, Authoring Tools, Application, Files. Data Compression Techniques - Representation and compression of text, sound, picture, and video files (JPEG and MPEG standards).

Web Engineering: www, domain name system, email, SMTP, HTML, DHTML, XML, Scripting, Java, Applets, Servlets,

Operating Research: Linear Programming Problem (LPP) in the standard form, LPP in Canonical form. Conversion of LPP in Standard form to LPP in Canonical form. Simplex method of solving LPP, Two-phase Simplex, Big-M method, quality theory and revised simplex. Transportation and Assignment problems and solutions.

UNIT-X

Theory of Computation : Formal language, Need for formal computational models, Non-computational problems, diagonal argument and Russel's paradox. Deterministic Finite Automaton (DFA), Non – deterministic Finite Automaton (NFA), Regular languages and regular sets, Equivalence of DFA and NFA. Minimizing the number of states of a DFA. Non-regular languages and Pumping lemma. Pushdown Automaton (PDA), Deterministic Pushdown Automaton (DPDA), Non – equivalence of PDA and DPDA.

Chomsky Hierarchy of languages: Type-0, Type-1, Type-2 & Type-3 languages, Recursive and recursively-enumerable languages.

Context free Grammars : Greibach Normal Form (GNF) and Chomsky Normal Form (CNF), Ambiguity, Parse Tree Representation of Derivations. Equivalence of PDA and CFG. Parsing techniques for parsing of general CFG – Early's, Cook-Kassami-Younger (CKY) and Tomita's parsing. RTNs, ATNs, Parsing of Ambiguous CFGs.

Linear Bounded Automata (LBA) : Power of LBA Closure properties.

Turing Machine (TM) : One tape, multi-tape, time and space complexity in terms of TM. Construction of TM, Computational complexity, Non-computability and Examples of non – computable problems.