राष्ट्रीय सूचना प्रबंधक केंद्र
प्रबंधित राजपत्राधिकत्तित तृतीय श्रेणी, कम्प्यूटर इंजिनियर वा सौ सरकारी पदको खुल्ला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

प्रथम चरण: लिखित परीक्षा योजना (Examination Scheme)

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<th>पूर्णांक</th>
<th>उत्तीरणांक</th>
<th>परीक्षा प्रणाली</th>
<th>प्रश्न संख्या x अंकेखर</th>
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<td>बस्तुगत बहुउत्तर</td>
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<td>1 घण्टा</td>
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द्वितीय चरण

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Section A - 24%

1. Computer Networks
   Protocol stack, switching
   Link Layer: services, error detection and correction, multiple access protocols, LAN addressing and ARP (Address Resolution Protocol), Ethernet, CSMA/CD multiple access protocol, Hubs, Bridges, and Switches, Wireless LANs, PPP (Point to Point Protocol), Wide area protocols
   Transport Layer: principles, multiplexing and demultiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control
   Application Layer: Web and Web caching, FTP (File Transfer Protocol), Electronic mail, DNS (Domain Name Service), socket programming
   Distributed system, Clusters

5. Computer Architecture & organization and micro-processors
   5.1 Basic Structures: sequential circuits, design procedure, state table and state diagram, von Neumann / Harvard architecture, RISC/CISC architecture
   5.2 Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction, cycle and excitation cycle.
   5.3 Processing Unit: instruction formats, arithmetic and logical instruction.
   5.4 addressing modes
   5.5 Input Output Organization: I/O programming, memory mapped I/O, basic interrupt system, DMA
   5.6 Arithmetic
   5.7 Memory Systems
   5.8 808X and Intel microprocessors: programming and interfacing

6. Digital Design
   6.2 Logic Elements
   6.3 Combinational Logic Circuits
   6.4 Sequential Logic
   6.5 Arithmetic Circuits
   6.6 MSI Logic circuits
   6.7 Counters and Registers
   6.8 IC logic families
   6.9 Interfacing with Analog Devices
   6.10 Memory Devices

13. Basic Electrical & Electronics
   13.1 Electrical
      13.1.1 Basic Circuit Theory
      13.1.2 AC circuit Fundamentals
      13.1.3 Magnetic circuits and Transformers
      13.1.4 Transient Analysis, Filters
13.2 **Electronics**
13.2.1 Semiconductors, Diodes and Diode Circuits, Transistors,
13.2.2 Transistor modeling
13.2.3 Biasing and Amplification
13.2.4 Small Signal amplifiers and frequency response
13.2.5 Large signal amplifiers, feedback amplifiers and Oscillators
13.2.6 Operational amplifiers

14. **Principles of Electronic Communications**
14.1 Block Diagram of analog/ digital communication system
14.2 Analog and Digital modulation techniques
14.3 Fundamentals of Error Detection and Correction
14.4 Performance evaluation of analog and digital communication systems; SNR and BER

**Section B- 26 %**

2. **Structured and object oriented programming**
2.1 Data types, ADT
2.2 Operators, variables and assignments, control structures
2.3 Procedure/function
2.4 Class definitions, encapsulation, inheritance, object composition, Polymorphism
2.5 Pattern and framework

4. **Data structures**
4.1 General concepts: Abstract data Type, Time and space analysis of algorithms, Big oh and theta notations, Average, best and worst case analysis
4.2 Linear data structures
4.3 Trees: General and binary trees, Representations and traversals, Binary search trees, balancing trees, AVL trees, 2-3 trees, red-black trees, self-adjusting trees, Splay Trees
4.4 Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
4.5 Hashing
4.6 Graphs and digraphs
4.7 Sorting

7. **Software Engineering principles (System analysis & design)**
7.1 Software process: The software lifecycle models, risk-driven approaches
7.2 Software Project management: Relationship to lifecycle, project planning, project control, project organization, risk management, cost models, configuration management, version control, quality assurance, metrics
7.3 Software requirements: Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review.
7.4 Software design: Design for reuse, design for change, design notations, design evaluation and validation
7.5 Implementation: Programming standards and procedures, modularity, data abstraction, static analysis, unit testing, integration testing, regression testing, tools for testing, fault tolerance
7.6 Maintenance: The maintenance problem, the nature of maintenance, planning for maintenance
7.7 SE issues: Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI-CMM, CASE tools

8. Database Management System
8.1 Introduction: The relational model, ER model, SQL, Functional dependency and relational database design, File structure
8.2 Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, Concurrency control techniques
8.3 Crash Recovery: types of failure, Recovery techniques
8.4 Query Processing and Optimization
8.5 Indexing: Hash based indexing, Tree based indexing
8.6 Distributed Database Systems and Object oriented database system
8.7 Data Mining and Data Warehousing
8.8 Security Management System

9. Operating System
9.1 Processes and Threads: Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock.
9.2 Scheduling
9.3 Memory Management
9.5 Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters.

3. Artificial Intelligence
3.1 Search
3.2 Natural Language Processing
3.3 Game Playing
3.4 Learning
3.5 Automated reasoning
3.6 Planning
3.7 Vision and Robotics

10. Theory of Computation
10.1 BNF, Languages, grammars
10.2 DFA and N DFA, regular expressions, regular grammars
10.3 Closure, homomorphism
10.4 Pigeonhole principle, pumping lemma
10.5 CFGs, Parsing and ambiguity, Pushdown automata, NPDAs & CFGs
10.6 Pumping lemma
10.7 Turing machines
10.8 Recursively enumerable languages Unrestricted grammars
10.9 The Chomsky hierarchy, Undecidable problems, Church's Thesis
10.10 Complexity Theory, P and NP
11. Compiler design
   11.1 The Structure of a Compiler
   11.2 Lexical Analyzer
   11.3 Top down Parsing/ Bottom up Parsing
   11.4 Syntax Directed Translation
   11.5 Types and Type Checking
   11.6 Run-Time Storage Administration
   11.7 Intermediate Code generation
   11.8 Data-Flow Analysis and Code Optimizations
   11.9 Architecture and recent development on compilers

   12.1 Graphics concepts
   12.2 Input devices and techniques
   12.3 Basic raster graphics algorithms and primitives
   12.4 Scan conversion
   12.5 Graphics hardware
   12.6 2D geometrical transformations and viewing
   12.7 3D geometry and viewing
   12.8 Hierarchical modeling
   12.9 Projections
   12.10 Hidden surface removal
   12.11 Shading and rendering

15. Emerging Technology and Electives
   15.1 Modeling and simulation
   15.2 Parallel and distributed computing
   15.3 High speed networks
   15.4 Artificial Neural Network and Computer Vision
   15.5 Adaptive web technology
   15.6 Software Architecture
   15.7 Distributed Object technology (ORB, DCOM)
   15.8 Speech signal processing
   15.9 Cryptography and network security
   15.10 E-commerce
   15.11 Software project management
   15.12 Embedded systems
   15.13 Image processing
   15.14 Multimedia
   15.15 Expert system
   15.16 GIS/ Remote sensing/ GPS

Section D- 30 %

16. Reasoning
   16.1 Analytical and logical reasoning
   16.2 Quantitative Test
   This section covers the examinee's reasoning aptitude as well as the presence of mind. Reasoning is to be done by reading a passage and answering the multiple choice question where as quantitative test is carried out by solving the mathematical problem (which needs no advanced level mathematical background)