## सुदुरपश्चिम प्रदेश

# प्रदेश निजामती सेवा तथा स्थानीय सरकारी सेवा अन्तरगत विविध सेवा, सातौं तह, कम्प्युटर इन्जिनियर वा सो सरह पदको खुला, अन्तर तह र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

# यस पाठ्यक्रम योजनालाई निम्न अनुसार दुई चरणमा विभाजन गरिएको छ:

 प्रथम चरण: लिखित परीक्षा (Written Examination)
 पूर्णांक: २००

 द्वितीय चरण: (क) सामूहिक परीक्षण(Group Test)
 पूर्णांक: १०

 (ख) अन्तरवार्ता(Interview)
 पूर्णांक: २५

परीक्षा योजना (Examination Scheme)

### प्रथम चरण : लिखित परीक्षा (Written Examination)

पत्र	विषय	खण्ड	पूर्णांक	उत्तीर्णांक	परीक्षा प्र	ग्रणाली	प्रश्न × अंक	समय
प्रथम	General Subject	खण्ड (क) General Awareness & General Reasoning Test खण्ड (ख) General Technical Subject	. 100	40	वस्तुगत (Objective)	(MCQs)	50 × 1	1:30 Hrs
द्वितीय	Technical Subject		100	40	विषयगत (Subjective)	छोटो उत्तर लामो उत्तर	$2 \times 5$ $7 \times 10$ $1 \times 20$	3 Hrs

# द्वितीय चरण: सामृहिक परीक्षण (Group Test) र अन्तरवार्ता(Interview)

पत्र/विषय	पूर्णांक	उत्तीर्णांक	परीक्षा प्रणाली	समय
सामूहिक परीक्षण (Group Test)	१०		सामूहिक छलफल (Group Discussion)	३० मिनेट
अन्तरवार्ता (Interview)	२५	-	मौखिक (Oral)	-

### द्रष्टव्य:

- १. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुबै हुन सक्नेछ।
- २. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ।
- ३. वस्तुगत बहुवैकिल्पक प्रश्नहरू (Multiple Choice Questions) को गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अंक कट्टा गरिनेछ। तर उत्तर नदिएमा त्यस बापत अंक दिइने छैन र अंक कट्टा पनि गरिने छैन।
- ४. बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन।
- ५. विषयगत प्रश्नका लागि तोकिएका १० अंकका प्रश्नहरूको हकमा १० अंकको एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सिकने छ।
- ६. द्वितीय पत्रमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तर पुस्तिकाहरू हुनेछन । परीक्षार्थीले प्रत्येक खण्डका प्रश्नहरूको उत्तर सोही खण्डको उत्तर पुस्तिकामा लेख्नु पर्नेछ ।
- ७. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापिन पाठ्यक्रममा परेका ऐन, नियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ।
- ८. प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको सामूहिक परीक्षण र अन्तरवार्तामा सम्मिलित गराइनेछ।
- ९. पाठ्यक्रम लागु मिति : २०८१।१०।२९ गते देखि

पूर्णांक : २००

पूर्णांक : ३५

## सुदुरपश्चिम प्रदेश

# प्रदेश निजामती सेवा तथा स्थानीय सरकारी सेवा अन्तरगत विविध सेवा, सातौं तह, कम्प्युटर इन्जिनियर वा सो सरह पदको खुला, अन्तर तह र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

प्रथम चरण : लिखित परीक्षा (Written Examination)

प्रथम पत्र: खण्ड (क)

### **General Awareness & General Reasoning Test (50 Marks)**

### 1. General Awareness and Contemporary Issues

(30 Marks)

- 1.1. Physical, socio-cultural and economic geography and demography of Nepal
- 1.2. Major natural resources of Nepal
- 1.3. Geographical diversity, climatic conditions and livelihood & lifestyle of people
- 1.4. Notable events and personalities, social, cultural and economic conditions in modern history of Nepal
- 1.5. National and Sudurpashchim Province Current periodic plan
- 1.6. Information on sustainable development, environment, pollution, climate change, biodiversity, science and technology
- 1.7. Nepal's international affairs and general information on the UNO, SAARC & BIMSTEC
- 1.8. The Constitution of Nepal (From Part 1 to 5 and Schedules)
- 1.9. Sudupashchim Province Civil Service Act, 2079 & Regulation, 2081
- 1.10. Local Government Operation Act, 2074
- 1.11. Sudurpashchim Province Good Government Act, 2075
- 1.12. Governance system and Government (Federal, Provincial and Local)
- 1.13. Functional scope of public services
- 1.14. Public Service Charter
- 1.15. Concept, objective and importance of public policy
- 1.16. Fundamentals of management: planning, organizing, directing, controlling, coordinating, decision making, motivation and leadership
- 1.17. Government planning, budgeting and accounting system
- 1.18. Major events and current affairs of national and international importance

### 2. General Reasoning Test

(20 Marks)

### 2.1. Logical Reasoning (7 Marks)

Verbal Ability, Alphanumeric Series, Reasoning Analogies, Classification, Coding-Decoding, Order & Ranking, Distance & Directions, Analytical and Logical Reasoning, Assertion and Reason, Statement and Conclusion, Input/output, Venn-diagram

### 2.2. Numerical Reasoning (7 Marks)

Arithmetic Series, Analogy, Classification, Arithmetical Reasoning, Fraction.

Percentage, Ratio, Average, Profit & Loss, Time & Work, Date & Calendar, Data Sufficiency, Data Interpretation & Data Verification

### 2.3. Spatial Reasoning (6 Marks)

Figure Series, Figure Analogy, Figure Classification, Figure Matrix, Pattern Completion, Embedded Images, Image Formation & Analysis, Mirror and Water Images, Cubes and Dices, Paper Folding & Cutting

# सुदूरपश्चिम प्रदेश

# प्रदेश निजामती सेवा तथा स्थानीय सरकारी सेवा अन्तरगत विविध सेवा, सातौं तह, कम्प्युटर इन्जिनियर वा सो सरह पदको खुला, अन्तर तह र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

प्रथम पत्र: खण्ड (ख)

# General Technical Subject (50 Marks) Section (A) - 17 Marks

### 1. Computer Networks

- 1.1. Protocol stack, switching
- 1.2. 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
- 1.3. Network Layer: services, datagram and virtual circuits, routing principles and algorithms, Internet Protocol (IP), IP addressing, IP transport, fragmentation and assembly, ICMP (Internet Control Message Protocol), routing on the internet, RIP (Routing Information Protocol), OSPF (Open Shortest Path First), router internals, IPv6
- 1.4. Transport Layer: principles, multiplexing and demultiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control
- 1.5. Application Layer: Web and Web caching, FTP (File Transfer Protocol), Electronic mail, DNS (Domain Name Service), socket programming
- 1.6. Distributed system, Clusters

### 2. Computer Architecture & Organization and Micro-Processors

- 2.1. Basic Structures: sequential circuits, design procedure, state table and state diagram, von Neumann / Harvard architecture, RISC/CISC architecture
- 2.2. Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction, cycle and excitation cycle.
- 2.3. Processing Unit: instruction formats, arithmetic and logical instruction.
- 2.4. Addressing modes
- 2.5. Input Output Organization: I/O programming, memory mapped I/O, basic interrupt system, DMA
- 2.6. Arithmetic
- 2.7. Memory Systems
- 2.8. 808X and Intel microprocessors: programming and interfacing

### 3. Digital Design

- 3.1. Digital and Analog Systems, Number Systems.
- 3.2. Logic Elements
- 3.3. Combinational Logic Circuits
- 3.4. Sequential Logic
- 3.5. Arithmetic Circuits
- 3.6. MSI Logic circuits
- 3.7. Counters and Registers
- 3.8. IC logic families
- 3.9. Interfacing with Analog Devices
- 3.10. Memory Devices

## सुदुरपश्चिम प्रदेश

# प्रदेश निजामती सेवा तथा स्थानीय सरकारी सेवा अन्तरगत विविध सेवा, सातौं तह, कम्प्युटर इन्जिनियर वा सो सरह पदको खुला, अन्तर तह र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

### 4. Basic Electrical & Electronics

### 4.1. Electrical

- 4.1.1. Basic Circuit Theory
- 4.1.2. AC circuit Fundamentals
- 4.1.3. Magnetic circuits and Transformers
- 4.1.4. Transient Analysis, Filters

#### 4.2. Electronics

- 4.2.1. Semiconductors, Diodes and Diode Circuits, Transistors,
- 4.2.2. Transistor modeling
- 4.2.3. Biasing and Amplification
- 4.2.4. Small Signal amplifiers and frequency response
- 4.2.5. Large signal amplifiers, feedback amplifiers and Oscillators
- 4.2.6. Operational amplifiers

### 5. Principles of Electronic Communications

- 5.1. Block Diagram of analog/digital communication system
- 5.2. Analog and Digital modulation techniques
- 5.3. Fundamentals of Error Detection and Correction
- 5.4. Performance evaluation of analog and digital communication systems: SNR and BER

### Section (B) - 18 Marks

### 6. Structured and Object Oriented Programming

- 6.1. Data types, ADT
- 6.2. Operators, variables and assignments, control structures
- 6.3. Procedure/function
- 6.4. Class definitions, encapsulation, inheritance, object composition, polymorphism
- 6.5. Pattern and framework

#### 7. Data Structures

- 7.1. General concepts: Abstract data Type, time and space analysis of algorithms, big oh and theta notations, average, best and worst case analysis
- 7.2. Linear data structures
- 7.3. 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
- 7.4. Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
- 7.5. Hashing
- 7.6. Graphs and digraphs
- 7.7. Sorting

# सुदूरपश्चिम प्रदेश

# प्रदेश निजामती सेवा तथा स्थानीय सरकारी सेवा अन्तरगत विविध सेवा, सातौं तह, कम्प्युटर इन्जिनियर वा सो सरह पदको खला, अन्तर तह र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

### 8. Software Engineering Principles (System Analysis & Design)

- 8.1. Software process: The software lifecycle models, risk-driven approaches
- 8.2. Software Project management: Relationship to lifecycle, project planning, project control, project organization, risk management, cost models, configuration management, version control, quality assurance, metrics
- 8.3. Software requirements: Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review.
- 8.4. Software design: Design for reuse, design for change, design notations, design evaluation and validation
- 8.5. Implementation: Programming standards and procedures, modularity, data abstraction, static analysis, unit testing, integration testing, regression testing, tools for testing, fault tolerance
- 8.6. Maintenance: The maintenance problem, the nature of maintenance, planning for maintenance
- 8.7. SE issues: Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI-CMM, CASE tools

### 9. Database Management System

- 9.1. Introduction: The relational model, ER model, SQL, Functional dependency and relational database design, File structure
- 9.2. Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, Concurrency control techniques
- 9.3. Crash Recovery: types of failure, Recovery techniques
- 9.4. Query Processing and Optimization
- 9.5. Indexing: Hash based indexing, Tree based indexing
- 9.6. Distributed Database Systems and Object oriented database system
- 9.7. Data Mining and Data Warehousing
- 9.8. Security Management System

### 10. Operating System

- 10.1. Processes and Threads: Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock
- 10.2. Scheduling
- 10.3. Memory Management
- 10.4. Input Output and Files: I/O devices and its organization, Principles of I/O software and hardware, Disks, Files and directories organization, File System Implementation
- 10.5. Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters
- 10.6. Security: Authentication and Access Authorization, System Flaws and Attacks, Trusted system

### Section (C) - 15 Marks

### 11. Artificial Intelligence

- 11.1. Search
- 11.2. Natural Language Processing

# सुदूरपश्चिम प्रदेश

# प्रदेश निजामती सेवा तथा स्थानीय सरकारी सेवा अन्तरगत विविध सेवा, सातौं तह, कम्प्युटर इन्जिनियर वा सो सरह पदको खुला, अन्तर तह र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

- 11.3. Game Playing
- 11.4. Learning
- 11.5. Automated reasoning
- 11.6. Planning
- 11.7. Vision and Robotics

### 12. Theory of Computation

- 12.1. BNF, Languages, grammars
- 12.2. DFA and NDFA, regular expressions, regular grammars
- 12.3. Closure, homomorphism
- 12.4. Pigeonhole principle, pumping lemma
- 12.5. CFGs, Parsing and ambiguity, Pushdown automata, NPDAs & CFGs
- 12.6. Pumping lemma
- 12.7. Turing machines
- 12.8. Recursively enumerable languages Unrestricted grammars
- 12.9. The Chomsky hierarchy, Undecidable problems, Church's Thesis
- 12.10. Complexity Theory, P and NP

### 13. Compiler Design

- 13.1. The Structure of a Compiler
- 13.2. Lexical Analyzer
- 13.3. Top down Parsing/ Bottom up Parsing
- 13.4. Syntax Directed Translation
- 13.5. Types and Type Checking
- 13.6. Run-Time Storage Administration
- 13.7. Intermediate Code generation
- 13.8. Data-Flow Analysis and Code Optimizations
- 13.9. Architecture and recent development on compilers

### 14. Computer Graphics

- 14.1. Graphics concepts
- 14.2. Input devices and techniques
- 14.3. Basic raster graphics algorithms and primitives
- 14.4. Scan conversion
- 14.5. Graphics hardware
- 14.6. 2D geometrical transformations and viewing
- 14.7. 3D geometry and viewing
- 14.8. Hierarchical modeling
- 14.9. Projections
- 14.10. Hidden surface removal
- 14.11. Shading and rendering

# सुदूरपश्चिम प्रदेश प्रदेश निजामती सेवा तथा स्थानीय सरकारी सेवा अन्तरगत विविध सेवा, सातौं तह, कम्प्युटर इन्जिनियर वा सो सरह पदको खुला, अन्तर तह र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

### 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

ΩΩΩ

# सुदूरपश्चिम प्रदेश

# प्रदेश निजामती सेवा तथा स्थानीय सरकारी सेवा अन्तरगत विविध सेवा, सातौं तह, कम्प्युटर इन्जिनियर वा सो सरह पदको खुला, अन्तर तह र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

द्वितीय पत्र: Technical Subject

### Section (A) – 25 Marks

### 1. Computer Networks

- 1.1. Protocol stack, switching
- 1.2. 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
- 1.3. Network Layer: services, datagram and virtual circuits, routing principles and algorithms, Internet Protocol (IP), IP addressing, IP transport, fragmentation and assembly, ICMP (Internet Control Message Protocol), routing on the internet, RIP (Routing Information Protocol), OSPF (Open Shortest Path First), router internals, IPv6
- 1.4. Transport Layer: principles, multiplexing and DE multiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control
- 1.5. Application Layer: Web and Web caching, FTP (File Transfer Protocol), Electronic mail, DNS (Domain Name Service), socket programming
- 1.6. Distributed system, Clusters

### 2. Computer Architecture & Organization and Micro-Processors

- 2.1. Basic Structures: sequential circuits, design procedure, state table and state diagram, von Neumann / Harvard architecture, RISC/CISC architecture
- 2.2. Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction, cycle and excitation cycle.
- 2.3. Processing Unit: instruction formats, arithmetic and logical instruction.
- 2.4. addressing modes
- 2.5. Input Output Organization: I/O programming, memory mapped I/O, basic interrupt system, DMA
- 2.6. Arithmetic
- 2.7. Memory Systems
- 2.8. 808X and Intel microprocessors: programming and interfacing

### 3. Digital Design

- 3.1. Digital and Analog Systems, Number Systems.
- 3.2. Logic Elements
- 3.3. Combinational Logic Circuits
- 3.4. Sequential Logic
- 3.5. Arithmetic Circuits
- 3.6. MSI Logic circuits
- 3.7. Counters and Registers
- 3.8. IC logic families
- 3.9. Interfacing with Analog Devices
- 3.10. Memory Devices

# सुद्रपश्चिम प्रदेश

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#### 4. Basic Electrical & Electronics

#### 4.1. Electrical

- 4.1.1. Basic Circuit Theory
- 4.1.2. AC circuit Fundamentals
- 4.1.3. Magnetic circuits and Transformers
- 4.1.4. Transient Analysis, Filters

### 4.2. Electronics

- 4.2.1. Semiconductors, Diodes and Diode Circuits, Transistors,
- 4.2.2. Transistor modeling
- 4.2.3. Biasing and Amplification
- 4.2.4. Small Signal amplifiers and frequency response
- 4.2.5. Large signal amplifiers, feedback amplifiers and Oscillators
- 4.2.6. Operational amplifiers

### 5. Principles of Electronic Communications

- 5.1. Block Diagram of analog/digital communication system
- 5.2. Analog and Digital modulation techniques
- 5.3. Fundamentals of Error Detection and Correction
- 5.4. Performance evaluation of analog and digital communication systems: SNR and BER

### Section (B) - 25 Marks

### 6. Structured and Object Oriented Programming

- 6.1. Data types, ADT
- 6.2. Operators, variables and assignments, control structures
- 6.3. Procedure/function
- 6.4. Class definitions, encapsulation, inheritance, object composition, polymorphism
- 6.5. Pattern and framework

### 7. Data Structures

- 7.1. General concepts: Abstract data Type, time and space analysis of algorithms, big oh and theta notations, average, best and worst case analysis
- 7.2. Linear data structures
- 7.3. 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
- 7.4. Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
- 7.5. Hashing
- 7.6. Graphs and digraphs
- 7.7. Sorting

### 8. Software Engineering Principles (System Analysis & Design)

8.1. Software process: The software lifecycle models, risk-driven approaches

# सुद्रपश्चिम प्रदेश

# प्रदेश निजामती सेवा तथा स्थानीय सरकारी सेवा अन्तरगत विविध सेवा, सातौं तह, कम्प्युटर इन्जिनियर वा सो सरह पदको खुला, अन्तर तह र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

- 8.2. Software Project management: Relationship to lifecycle, project planning, project control, project organization, risk management, cost models, configuration management, version control, quality assurance, metrics
- 8.3. Software requirements: Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review.
- 8.4. Software design: Design for reuse, design for change, design notations, design evaluation and validation
- 8.5. Implementation: Programming standards and procedures, modularity, data abstraction, static analysis, unit testing, integration testing, regression testing, tools for testing, fault tolerance
- 8.6. Maintenance: The maintenance problem, the nature of maintenance, planning for maintenance
- 8.7. SE issues: Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI-CMM, CASE tools

### 9. Database Management System

- 9.1. Introduction: The relational model, ER model, SQL, Functional dependency and relational database design, File structure
- 9.2. Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, Concurrency control techniques
- 9.3. Crash Recovery: types of failure, Recovery techniques
- 9.4. Query Processing and Optimization
- 9.5. Indexing: Hash based indexing, Tree based indexing
- 9.6. Distributed Database Systems and Object oriented database system
- 9.7. Data Mining and Data Warehousing
- 9.8. Security Management System

### 10. Operating System

- 10.1. Processes and Threads: Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock
- 10.2. Scheduling
- 10.3. Memory Management
- 10.4. Input Output and Files: I/O devices and its organization, Principles of I/O software and hardware, Disks, Files and directories organization, File System Implementation
- 10.5. Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters
- 10.6. Security: Authentication and Access Authorization, System Flaws and Attacks, Trusted system

### Section (C) - 20 Marks

### 11. Artificial Intelligence

- 11.1. Search
- 11.2. Natural Language Processing
- 11.3. Game Playing
- 11.4. Learning
- 11.5. Automated reasoning
- 11.6. Planning
- 11.7. Vision and Robotics

# सुद्रपश्चिम प्रदेश

# प्रदेश निजामती सेवा तथा स्थानीय सरकारी सेवा अन्तरगत विविध सेवा, सातौं तह, कम्प्युटर इन्जिनियर वा सो सरह पदको खुला, अन्तर तह र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

### 12. Theory of Computation

- 12.1. BNF, Languages, grammars
- 12.2. DFA and NDFA, regular expressions, regular grammars
- 12.3. Closure, homomorphism
- 12.4. Pigeonhole principle, pumping lemma
- 12.5. CFGs, Parsing and ambiguity, Pushdown automata, NPDAs & CFGs
- 12.6. Pumping lemma
- 12.7. Turing machines
- 12.8. Recursively enumerable languages Unrestricted grammars
- 12.9. The Chomsky hierarchy, Undecidable problems, Church's Thesis
- 12.10. Complexity Theory, P and NP

### 13. Compiler Design

- 13.1. The Structure of a Compiler
- 13.2. Lexical Analyzer
- 13.3. Top down Parsing/ Bottom up Parsing
- 13.4. Syntax Directed Translation
- 13.5. Types and Type Checking
- 13.6. Run-Time Storage Administration
- 13.7. Intermediate Code generation
- 13.8. Data-Flow Analysis and Code Optimizations
- 13.9. Architecture and recent development on compilers

### 14. Computer Graphics

- 14.1. Graphics concepts
- 14.2. Input devices and techniques
- 14.3. Basic raster graphics algorithms and primitives
- 14.4. Scan conversion
- 14.5. Graphics hardware
- 14.6. 2D geometrical transformations and viewing
- 14.7. 3D geometry and viewing
- 14.8. Hierarchical modeling
- 14.9. Projections
- 14.10. Hidden surface removal
- 14.11. 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

# सुद्रपश्चिम प्रदेश

# प्रदेश निजामती सेवा तथा स्थानीय सरकारी सेवा अन्तरगत विविध सेवा, सातौं तह, कम्प्युटर इन्जिनियर वा सो सरह पदको खुला, अन्तर तह र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

- 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 Marks

### 16. This section consists of 2 (two) sub-sections i.e. Technical Writing and Case Study.

### 16.1. **Technical Writing** (1 Question - 10 marks)

This section may ask the examinee to write technical proposal on given specification, essay, views/critics etc. The topic must be related to computer technology or the matter related therewith and examinee should be encouraged to put his/her own views and reasoning rather than facts/information.

### 16.2. Case Study (1 Question - 20 marks)

This section is dedicated to the analysis and design of a software system. Examinee should be given a scenario of existing system and asked to analyze and design it following one particular paradigm. This section should include the various domain of knowledge in one platform (for e.g. a case study may incorporate questions from Software Engineering and Database management and Operating system domains).

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# द्वितीय चरण (Second Phase): सामूहिक परीक्षण (Group Test) र अन्तरवार्ता (Interview)

# सामूहिक परीक्षण (Group Test)

(१० अंक)

# सामूहिक छलफल (Group Discussion)

यस प्रयोजनको लागि गरिने परीक्षण १० पूर्णाङ्क र ३० मिनेट अवधिको हुनेछ, जुन नेता विहिन सामूहिक छलफल (Leaderless Group Discussion) को रुपमा अवलम्बन गरिने छ। दिइएको प्रश्न वा Topic का विषयमा पालैपालोसंग निर्दिष्ट समय भित्र समूह बीच छलफल गर्दै प्रत्येक उम्मेदवारले व्यक्तिगत प्रस्तुति (Individual Presentation) गर्नु पर्नेछ।

### सामूहिक छलफलमा दिइने नमुना प्रश्न वा Topic

उदाहरणको लागि - उर्जा संकट, गरीबी निवारण, बाली बीमा, सामाजिक सुरक्षा, खाद्य सुरक्षा, प्रतिभा पलायन, स्वास्थ्य बीमा, जलवायु परिवर्तन, आरक्षण जस्ता समसामयिक विषयवस्तुहरुबाट कुनै एक Topic दिइनेछ |

# अन्तरवार्ता (Interview)

(२५ अंक)

मौखिक (Oral)

### $\Omega\Omega$ the end $\Omega\Omega$