सूर्यवनिायक नगरपालिका

विविध सेवा, सातौं तह, सूचना प्रविधि अधिकृत पदको प्रतियोगितात्मक परीक्षाको पाठयक्रम

पाठयक्रमको रुपरेखा :– यस पाठयक्रमको आधारमा निम्नानुसार चरणमा परीक्षा लिइने छ :

प्रथम चरण :–	लिखित परीक्षा	पूर्णाङ्क :– १००
द्वितीय चरण :–	अन्तर्वार्ता	पूर्णाङ्क :– २०

प्रथम चरण – लिखित परीक्षा योजना (Written Examination Scheme)

पत्र/विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या **X** अङ्कभार	समय
सेवा सम्बन्धी	१००	४०	वस्तुगत बहुवैकल्पिक (Multiple Choice)	५० प्रश्न X २अङ्क = १००	४५ मिनेट

द्वितीय चरण

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	२०	मौखिक

द्रष्टव्य :

१. यो पाठयक्रम योजनालाई प्रथम चरण (लिखित परीक्षा) तथा द्वितीय चरण (अन्तर्वार्ता) गरी दुई भागमा विभाजन गरिएको छ ।
२. प्रश्नपत्र अंग्रेजी भाषामा हुनेछ ।
३. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
४. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरुको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत अङ्क कट्टा गरिने छैन ।
५. परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
६. परीक्षामा यथासम्भव सबै इकाईबाट प्रश्न सोधिने छ ।
७. नगरपालिकाबाट संचालन हुने परीक्षामा परीक्षार्थीले मोबाइल वा यस्तै प्रकारका विद्युतीय उपकरण परीक्षा हलमा लैजान पाइने छैन ।
८. यस पाठयक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठयक्रममा परेका कानून, ऐन, नियम तथा नीतिहरु परीक्षाका मिति भन्दा ३ महिना अगाडि (संशोधन भएको वा संशोधन भई हटाईएको वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ।
९. लिखित परीक्षामा छनौट भएका उम्मेदवारहरुलाई मात्र अन्तर्वार्तामा सम्मिलित गराइनेछ ।
१०. लिखित परीक्षा र अन्तर्वार्ताको कुल अङ्क योगका आधारमा अन्तिम परीक्षाफल प्रकाशित गरिनेछ ।

विषय :– सेवा सम्बन्धी

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

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

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
   - 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/Serve Computing, Clusters

10.6 Security : Authentication and Access Authorization, System Flaws and Attacks, Trusted system

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

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
- 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