

नागरिक लगानी कोष

प्राविधिक सेवा, प्राविधिक समूह, छैठौँ तह, सहायक कम्प्युटर अधिकृत पदको खुल्ला
प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

१. पाठ्यक्रमको उद्देश्य:-

- Operating System को राम्रो ज्ञान भई MS-Dos, Windows 2000, Windows XP, Windows NT तथा Linux को सहज रुपमा प्रयोग गर्न सक्ने ।
- File एवं Disk Management सम्बन्धी कार्य गर्न सक्ने ।
- कम्प्युटरको Printer, CD-ROM, Multimedia, Scanner, Pen drives लगायत अन्य Accessories को प्रयोग गर्न सक्ने ।
- Software Installation एवं Customization गर्न सक्ने ।
- Computer related threats बाट Computer Accessories तथा Software को सुरक्षा गर्न सक्ने ।
- Computer Architecture, Digital Design, Compiler Design, Theory of Computation, Principles of Electronics Communication बारे राम्रो ज्ञान हुने ।
- Artificial Intelligence, Data Structures एवं Algorithms बारे राम्रो ज्ञान हुने ।
- Software Engineering बारे राम्रो ज्ञान हुने तथा System Analysis गरी Design समेत गर्न सक्ने ।
- DBMS को Architecture बारे ज्ञान हुने तथा Oracle, Sybase, DB2, SQL Server, तथा अन्य database हरुको प्रयोग गरी Database Design गर्न सक्ने ।
- C, C++, Java programming language प्रयोग गरी program लेख्न सक्ने ।
- Network सम्बन्धी राम्रो ज्ञान भएको, Network बारे security दिने, Trouble shooting गर्ने तथा Network support tool प्रयोग गरी काम गर्न सक्ने ।
- e-Commerce Technology बारे राम्रो ज्ञान हुने ।
- संविधान, ICT Policy, Cyber Law, Copyright, सार्वजनिक खरीद, धितोपत्र, नागरिक लगानी कोष, कम्पनि, बैंक तथा वित्तिय संस्था सम्बन्धी कानूनहरुबारे राम्रो ज्ञान हुने ।

२. परीक्षा योजना(Examination Scheme):-

पाठ्यक्रमको रुपरेखा:- यस पाठ्यक्रमको आधारमा निम्नानुसार चरणमा परीक्षा लिइनेछ :

प्रथम चरण:- लिखित परीक्षा

पूर्णाङ्क :- १५०

द्वितीय चरण :- (क) प्रयोगात्मक

पूर्णाङ्क :- ५०

(ख) अन्तर्वार्ता

पूर्णाङ्क :- ३०

प्रथम चरण- लिखित परीक्षा योजना(Examination Scheme) :-

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	समूह	प्रश्न संख्या र अङ्कभार	समय
प्रथम		५०	२०	वस्तुगत बहुवैकल्पिक (Multiple Choice)	क, ख	$५० \times १ = ५०$	४५ मिनेट
द्वितीय	कम्प्युटर सम्बन्धी	१००	४०	विषयगत (Subjective)	क	$६ \times ५ = ३०$ $२ \times १० = २०$	२ घण्टा ३० मिनेट
					ख	$६ \times ५ = ३०$ $२ \times १० = २०$	

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द्वितीय चरण

क्र.सं.	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या	समय
(क)	प्रयोगात्मक परीक्षा	५०	२५	प्रयोगात्मक	५	१ घण्टा ३० मिनेट
(ख)	अन्तर्वार्ता	३०	-	मौखिक	-	-

- लिखित परीक्षाको माध्यम भाषा नेपाली, अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ ।
- पाठ्यक्रमको प्रथम तथा द्वितीय पत्रको परीक्षाको विषय वस्तु एउटै हुनेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- बहुवैकल्पिक प्रश्नहरु हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
- बहुवैकल्पिक प्रश्नहरुको उत्तर सहीदिमा प्रत्येक सहीउत्तर बापत १ अङ्क प्रदान गरिनेछ भने गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषय वस्तुमा जेसुकै लेखिएको भएतापनि पाठ्यक्रममा परेका कानुन, ऐन, नियम तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संसोधन भएका वा संसोधन भई हटाईएका वा थप गरी संसोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
- वस्तुगत बहुवैकल्पिक परीक्षाका प्रश्न संख्या निम्नानुसार हुनेछन् ।

क्र.सं.	पाठ्यांश	प्रश्न संख्या
1.	Computer Fundamentals	5
2.	Computer Architecture and Microprocessors	2
3.	Artificial Intelligence	2
4.	Digital Design	2
5.	Compiler Design	2
6.	Theory of Computation	2
7.	Principles of Electronic Communication	1
8.	Operating System	3
9.	Web Technology	3
10.	e-Commerce Technology	2
11.	Computer Networks	5
12.	Structured and OOP	3
13.	Data Structures and Algorithm	3
14.	Software Engineering	3
15.	Database Management System	6
16.	IT in Nepal, Policy, Laws and Emerging Technologies	6
Total		50

- लिखित परीक्षाबाट छनौट भएका परीक्षार्थीहरुले मात्र प्रयोगात्मक परीक्षा र अन्तर्वार्तामा भाग लिन पाउनेछन् ।
- प्रयोगात्मक परीक्षामा उत्तीर्ण हुने परीक्षार्थीहरुको मात्र तीनै भागका परीक्षाको प्राप्ताङ्क जोडी योग्यताक्रम अनुसार परीक्षाफल प्रकाशित गरिनेछ ।
- प्रयोगात्मक परीक्षाका प्रश्न संख्या निम्नानुसार हुनेछन् ।

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S.N.	Topics	No. of Questions	Marks	Time (Minutes)
1.	Operating System	1	5	1 Hour 30 Minutes
2.	Database Management System	1	15	
3.	Web Technology	1	5	
4.	Computer Networks	1	10	
5.	Structured & OOP	1	15	
Total		5	50	

Contents

खण्ड क (पूर्णाङ्क ५०)

1. Computer Fundamentals

1.1 Computer :- Definition, History, Generation, Characteristics, Types & Applications

1.2 Overview of a computer system :-

1.2.1 Data and data processing

1.2.2 Hardware

1.2.2.1 Definition of Hardware

1.2.2.2 Input Unit- Keyboard, Mouse, Scanner etc.

1.2.2.3 CPU-Arithmetic Logic Unit (ALU), Control Unit (CU), Memory Unit

1.2.2.4 Output Unit: - Monitor, Printer, etc.

1.2.2.5 Storage devices :- Primary & Auxiliary Memory (Floppy Disk, Hard Disk, Compact Disk, DVD, Super Disks, Zip Disks, Cartridge tape, Flash Disks, etc.)

1.2.2.6 Others: - Network card, Modem, Sound card, etc.

1.2.3 Software

1.2.3.1 Definition & Types of Software

1.2.3.2 Programming Language

1.2.4 Live ware

1.2.5 Firmware and Cache Memory

1.3 Setting & Protection of Computer Room and Computer

1.4 Concept of Computer related threats (Viruses, worms, Trojan, phishing etc.), their Remedies and protection

1.5 Concept of Multimedia

1.6 Introduction to ASCII and Unicode and font types

1.7 Number System: Number Systems (Binary, Octal, Decimal, Hexadecimal) and their conversion

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1.8 Security

1.8.1 Physical Security of Information Technology Infrastructure

1.8.2 Digital security: Antivirus, Firewalls, Antispyware, User authentication types, IPS/IDS

1.8.3 Common security threats: Social engineering, Malware, Phishing, Spyware, Viruses, Worms, Trojans, Distributed Denial of Services

2. Computer Architecture and Microprocessors

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 Memory Systems

2.7 808X and Intel microprocessors: programming and interfacing

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

4. Digital Design :

4.1 Digital and Analog Systems.

4.2 Number Systems,

4.3 Logic Elements,

4.4 Combinational Logic Circuits,

4.5 Sequential Logic,

4.6 Arithmetic Circuits,

4.7 MSI Logic Circuits,

4.8 Counters and Registers,

4.9 IC logic families,

4.10 Interfacing with Analog Devices,

4.11 Memory Devices

5. Compiler Design :

5.1 The Structure of a Compiler

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- 5.2 Lexical Analyzer
- 5.3 Top down Parsing/Bottom up Parsing
- 5.4 Syntax Directed Translation
- 5.5 Types and Type Checking
- 5.6 Run-Time Storage Administration
- 5.7 Intermediate Code Generation
- 5.8 Data-Flow Analysis and Code Optimizations
- 5.9 Architecture and recent development on compilers
- 6. Theory of Computation :**
 - 6.1 BNF, Languages, Grammars
 - 6.2 DFA and NDFA, regular expressions, regular grammars
 - 6.3 Closure, homomorphism
 - 6.4 Pigeonhole principle, pumping lemma
 - 6.5 CFGs, Parsing and ambiguity, Pushdown automata, NPDAs & CFGs
 - 6.6 Pumping lemma
 - 6.7 Turing machines
 - 6.8 Recursively enumerable languages, unrestricted grammars
 - 6.9 The Chomsky hierarchy, Undecidable problems, Church's Thesis
 - 6.10 Complexity Theory, P and NP
- 7. Principles of Electronics Communications :**
 - 7.1 Block Diagram of analog/digital communication system
 - 7.2 Analog and Digital modulation techniques
 - 7.3 Fundamentals of Error Detection and Correction
 - 7.4 Performance evaluation of analog and digital communication systems
- 8. Operating System**
 - 8.1 Introduction, Types and Functions of operating systems
 - 8.2 **Processing and Threads:** Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock
 - 8.3 Scheduling
 - 8.4 Memory Management
 - 8.5 **Input Output and Files:** I/O devices and its organization, Principles of I/O software and hardware, Disks, Physical Structure of the disk, Concept of File and Folder, organization of Files and directories, File System Implementation, Types of files and file extensions, Wildcards and Pathname
 - 8.6 **Distributed Systems:** Distributed Message passing, RPC, Client/Server Computing, Clusters
 - 8.7 **Security:** Authentication and Access Authorization, System Flaws and Attacks, Trusted System
 - 8.8 **Common Operating Systems:** MS-DOS (Introduction, System files of MS-DOS and their functions, using DOS commands, Creating and Using

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AUTOEXEC.BAT and CONFIG.SYS file), Windows Family of Products, Unix Family of Products, Linux Family of Products, Windows Networking, Windows Architecture, Linux Architecture, Troubleshooting Windows, & Linux, Managing Network Printing, Managing Hard Disks and Partitions, Monitoring and Troubleshooting Windows, Users, Groups and Permission on Linux and Windows. Sharing file, folder, printer, application, etc.

खण्ड ख (पूर्णाङ्क ५०)

9. Web Technology

- 9.1 Introduction to Web Page and Content Management System
- 9.2 Introduction to HTML, HTML document and HTML Tags
- 9.3 Working with Text, Hyperlinks, Images, Lists, Forms, Tables, Frames, etc.
- 9.4 Familiarity with Cascading Style Sheet, and Rich Site Summary
- 9.5 Familiarity with JavaScript, XML
- 9.6 Concept of Web server and Proxy server
- 9.7 Social Networking and Social Media in Governance

10. E-Commerce Technology

- 10.1 Introduction to E-Commerce.
- 10.2 Electronic Commerce Strategies.
- 10.3 Electronic Commerce Security Issues.
- 10.4 E-governance, Success Models of E-Governance.
- 10.5 E-Business: b2b, b2c, b2e, c2c, g2g, g2c.
- 10.6 Principles of Electronic Payment, Strategies & Systems.
- 10.7 E-marketing, Reverse Engineering.
- 10.8 E-Banking, EDI Methods, SWIFT.
- 10.9 Encryption and Decryption Methods, XML, Layout Managers, Event Model.

11. Computer Networks

- 11.1 **Introduction:** Definition, Types, Network Media and Topologies
- 11.2 Familiarity with internet browsers (IE, Firefox, Opera, Safari, Google Chrome etc.)
- 11.3 Concept about E-mail, Internet, Intranet, Extranet
- 11.4 OSI Reference model
- 11.5 Introduction to Protocol, Protocol stack, Switching
- 11.6 **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

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- 11.7 **Network Layer:** Services, datagram and virtual circuits, routing principles and algorithms, Internet Protocol (IP), IP address, Subnet mask, 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
- 11.8 **Transport Layer:** principles, multiplexing and de-multiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control
- 11.9 **Application Layer:** Web and Web caching, FTP (File Transfer Protocol), DNS (Domain Name Service), socket programming
- 11.10 Distributed system, Clusters, Network Security, Disaster Recovery, Data Storage Techniques: Clustering, NAS, SAN
- 12. Structured and Object Oriented Programming**
 - 12.1 Data types, ADT
 - 12.2 Operators, variables and assignments, control structures, Procedure/function
 - 12.3 Class definitions, encapsulation, inheritance, object composition, Polymorphism
 - 12.4 Pattern and framework
 - 12.5 Programming with C, C++, Java
- 13. Data Structures and Algorithms**
 - 13.1 **General concepts:** Abstract data types, Time and space analysis of algorithms, Big Oh and theta notations, Average, best and worst case analysis
 - 13.2 **Linear data structures:** Lists, Linked Lists, Stacks, Queues, Priority Queue
 - 13.3 **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
 - 13.4 **Algorithm design techniques:** Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Backtracking and Recursion
 - 13.5 **Indexing Methods:** Hashing Trees, Suffix Trees
 - 13.6 **Graph algorithms:** Depth-first Search and Breadth-first Search, Shortest Path Problems, Minimum Spanning Trees, Directed Acyclic Graphs.
 - 13.7 Searching, Merging and Sorting
- 14. Software Engineering**
 - 14.1 **Software process:** Software Process models, risk-driven approaches

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- 14.2 **Software Project Management:** Relationship to lifecycle, project planning, project control, project organization, risk management, cost models, configuration management, version control, quality assurance, metrics
- 14.3 **Software requirements:** Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review.
- 14.4 **Software design:** Design for reuse, design for change, design notations, design evaluation and validation, Software Architecture, Context diagram and DFD, Object Modeling: Object-Oriented Concept, Object Structure, Object Feature, Class and Object, Use Case Diagram, State Diagram, Event Flow Diagram
- 14.5 **Implementation:** Programming standards and procedures, modularity, data abstraction, static analysis, unit testing, integration testing, regression testing, tools for testing, fault tolerance.
- 14.6 **Maintenance:** The maintenance problem, the nature of maintenance, planning for maintenance
- 14.7 **SE issues:** Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI-CMM, CASE tools
- 15. Database Management System**
 - 15.1 **Introduction:** The relational model, ER model, SQL, Functional dependency and relational database design, File structure
 - 15.2 **Transaction Management and Concurrency Control:** Concurrent execution of programs, transactions, Concurrency control techniques
 - 15.3 **Crash Recovery:** Types of failure, Recovery techniques
 - 15.4 Query Processing and Optimization
 - 15.5 **Indexing:** Hash based indexing, Tree based indexing
 - 15.6 Distributed Database Systems and Object oriented database system
 - 15.7 Data Mining and Data Warehousing
 - 15.8 Security Management System
 - 15.9 SQL and Embedded SQL, Writing Basic SQL SELECT Statements, Restricting and Sorting data, Single Row Functions, Displaying Data from Multiple Tables, Aggregation of Data Using Group Functions, Sub Queries, Manipulating Data and Creating & Managing Tables, Creating Views and Controlling User Access,
 - 15.10 **Database Design:** Logical Design, Conceptual Design, Mapping Conceptual to Logical, Pragmatic issues, Physical Design, Integrity and Correctness, Relational Algebra, Relational Calculus. Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, DKNF, Database

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Design with major RDBMS products: Oracle, Sybase, DB2, MS-SQL.

16. IT in Nepal, Policy, Laws and Emerging Technologies

- 16.1 नेपालको संविधान,
 - 16.2 History of IT in Nepal,
 - 16.3 Nepali Unicode, Nepali Fonts
 - 16.4 Cryptography, Digital Signature
 - 16.5 Multimedia, Image processing, GIS, Remote sensing, GPS
 - 16.6 Information Systems and Decision Making, Work Process Redesign (Reengineering), Knowledge Management, ERP System
 - 16.7 Mobile Apps: Definition and Approaches to Apps Development
 - 16.8 ICT Policy, 2072 B.S.
 - 16.9 Electronic Transaction Act, 2063 B.S.
 - 16.10 Copyright Act, 2059 B.S.
 - 16.11 नागरिक लगानी कोष ऐन, २०४७
 - 16.12 नागरिक लगानी कोष (व्यवस्थापन) विनियमावली, २०४८
 - 16.13 सार्वजनिक खरिद ऐन, २०६३ तथा नियमावली, २०६४
 - 16.14 नागरिक लगानी कोष खरीद विनियमावली, २०७५
 - 16.15 कम्पनी ऐन, २०६३
 - 16.16 बैंक तथा वित्तीय संस्था सम्बन्धी ऐन, २०७३
 - 16.17 धितोपत्र कारोवार सम्बन्धि ऐन, २०६३
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