

काठमाडौं महानगरपालिका
कम्प्युटर प्रोग्रामर खुला र आन्तरिक प्रतियोगितात्मकको
छैठौं तह (अधिकृत वा सो सरह) को
लिखित परीक्षाको पाठ्यक्रमको ढाँचा

पाठ्यक्रमको उद्देश्य :-

- १) MS-Dos, Windows Clients OSs: Windows XP, Windows Vista/7/8 को ज्ञान भएको तथ्य प्रयोग गर्न सक्ने । Linux को समेत आधारभूत ज्ञान हुन सक्ने ।
- २) File/disk Management सम्बन्धी कार्य गर्न सक्ने ।
- ३) Computer printer, CD/DVD-Rom, Pen drives, External Hard Drive, Multimedia र Scanner समेत अन्य Computer Accessories को प्रयोग गर्न सक्ने ।
- ४) MS-Office package प्रयोग गर्न सक्ने ।
- ५) Computer fundamental बारे राम्रो ज्ञान हुन सक्ने
- ६) Data structure र Algorithms बारे राम्रो ज्ञान हुन सक्ने ।
- ७) System Analysis गरी Design समेत गर्न सक्ने ।
- ८) Database design गर्न सक्ने, DBMS को Architecture बारे ज्ञान हुने तथा Oracle, Sybase, DB2, SQL Server, MySQL अन्य database हरुको General concept भएको हुन सक्ने ।
- ९) C, C++ र Java programming language प्रयोग गरी program लेख्न र उक्त प्रोग्राम प्रयोग गर्दै Output निकाल्न सक्ने ।
- १०) Computer Networking सम्बन्धी basic concept भएको, Network बारे security दिने, Trouble shooting गर्ने तथा Network support tool प्रयोग गरी काम गर्न सक्ने
- ११) Data Encrypting, Security सम्बन्धी राम्रो ज्ञान हुन सक्ने ।
- १२) e-Commerce Technology र Management Information System (MIS) बारे राम्रो ज्ञान भएको हुने ।
- १३) नेपाल सरकारले तयार गरेका IT Policy 2000, Cyber Law of Nepal, Copy Write Law, नेपालमा विकास भई प्रयोग भैरहेको Computer Technology बारे राम्रो ज्ञान हुन सक्ने ।

पाठ्यक्रमको रूपरेखा :- यस पाठ्यक्रमको आधारमा निम्नानुसार तीन चरणमा परीक्षा लिइने छ :

प्रथम चरण :- लिखित परीक्षा	पूर्णाङ्क :- १६०
द्वितीय चरण :- (क) प्रयोगात्मक	पूर्णाङ्क :- ५०
(ख) अन्तर्वार्ता	पूर्णाङ्क :- ३०

प्रथम चरण – लिखित परीक्षा योजना (Examination Scheme)

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या X अङ्कभार	समय
प्रथम	कम्प्युटर	१००	४०	वस्तुगत बहुउत्तर (Multiple Choice)	१००X१ = १००	१ घण्टा १५ मिनेट
द्वितीय	सम्बन्धी विषय	५०	२०	विषयगत (Subjective)	५X१० = ५०	१ घण्टा ३० मिनेट

(क)	प्रयोगात्मक परीक्षा	५०	२५	प्रयोगात्मक	५x१० = ५०	२ घण्टा
(ख)	अन्तर्वार्ता	३०	-	मौखिक	-	-

१. लिखित परीक्षा र प्रयोगात्मक परीक्षाको माध्यम भाषा अंग्रेजी वा नेपाली अथवा अंग्रेजी र नेपाली दुवै हुन सक्नेछ ।
२. माथि उल्लिखित समूहको पाठ्यक्रमको प्रथम र द्वितीय पत्र तथा प्रयोगात्मक परीक्षाको विषयवस्तु एउटै हुनेछ ।
३. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
४. लिखित परीक्षा तथा प्रयोगात्मक परीक्षाका प्रश्नसंख्या निम्नानुसार हुनेछन् :-

प्रथम पत्रका एकाई	1	2	3	4	5	6	7	8	9	10	11	12
प्रश्न संख्या	10	8	10	10	15	7	10	3	2	5	10	10
द्वितीय पत्रका एकाई	1	2	3	4	5	6	7	8	9	10	11	12
प्रश्न संख्या	-	1	1	1	1	1	-	-	-	-	-	1
प्रयोगात्मक परीक्षाको एकाई	1	2	3	4	5	6	7	8	9	10	11	12
प्रश्न संख्या	-	-	-	1	1	2	1	-	-	-	-	-

५. द्वितीय पत्रको विषयगत प्रश्नहरूको स्वरूप निम्नानुसार हुन सक्नेछ :
 - ५.१ लामो उत्तर दिने १० अङ्कका पूरा प्रश्नहरू सोध्न सकिनेछ ।
 - ५.२ एउटै प्रश्नलाई दुई वा दुई भन्दा बढी भागमा (Two or more parts of a single question) विभाजन गरी सोध्न सकिनेछ ।
 - ५.३ एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिने छ ।
६. प्रथम पत्रमा वस्तुगत बहुउत्तर (Multiple Choice) प्रश्नहरूको उत्तर सही दिएमा प्रत्येक सही उत्तर बापत १ (एक) अङ्क प्रदान गरिनेछ, भने गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अर्थात् ०.२ अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।
७. यस पाठ्यक्रममा जेसुकै लेखिएको भएता पनि पाठ्यक्रममा परेका ऐन, नियमहरू परीक्षाको मिति भन्दा ३ (तीन) महिना अगाडि (संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा रहेको सम्झनु पर्दछ ।
८. प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको प्रयोगात्मक परीक्षा र अन्तर्वार्तामा सम्मिलित गराइनेछ । प्रयोगात्मक परीक्षामा उत्तीर्ण हुने उम्मेदवारहरूको मात्र प्रथम र द्वितीय चरणका परीक्षाहरूको प्राप्ताङ्क जोडी योग्यताक्रम कायम गरिने छ ।
१०. पाठ्यक्रम लागू मिति :- २०७३/२/२४ देखि

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प्रथम र द्वितीय पत्र :- कम्प्युटर सम्बन्धी विषय

1. Computer Fundamentals

- 1.1 Computers, Kinds of Computers in respect of size and function,
- 1.2 Generation of Computers,
- 1.3 Components and Architecture of Computers, Connecting the Components,
- 1.4 **Getting started:** Orientation to personal computers, The system unit, Starting the computers
- 1.5 **Input Devices:** The keyboard, The mouse, Other input devices
- 1.6 **Processing:** CPU, Memory
- 1.7 **Storages devices:** Overview of Storage Devices, The Floppy Disk Drive, The Hard Drive, The Universal Serial Bus(USB) Devices and Other Storage Devices
- 1.8 **Output devices:** Monitors, Printers, Modems, Soundboards
- 1.9 **Dos survival guide:** Using Command Prompt, Creating and using AUTOEXEC.BAT and CONFIG.SYS
- 1.10 **Windows survival guide:** The Windows Desktop, The Program Manager, Organizing the Desktop, The File Manager
- 1.11 **Application software:** Using Application Software
- 1.12 Windows Explorer, E-mails, Internet ,Intranet, Extranets, Ethernet, HTTP
- 1.13 Computer Viruses, Antivirus

2. Data Structure and Algorithms

- 2.1 Fundamental of Data Structures, Abstract Data types,
- 2.2 Lists, Linked Lists, Stacks,
- 2.3 Queues, Priority Queue,
- 2.4 **Trees:** Traversal, Implementations, Binary Trees, Binary Search Trees, Balanced Search Trees, AVL Trees.
- 2.5 Indexing Methods. Hashing Trees, Suffix Trees.
- 2.6 Worst-Case and Expected time Complexity.
- 2.7 Analysis of Simple Recursive and Nonrecursive Algorithms.
- 2.8 Searching, Merging and Sorting.
- 2.9 **Introductory Notions of algorithm design:** Divide-and-Conquer , Dynamic Programming ,Greedy Methods ,Backtracking
- 2.10 **Graph algorithms:** Depth-first Search and Breadth-first Search , Shortest Path Problems ,Minimum Spanning Trees ,Directed Acyclic Graphs .

3. System Analysis and Design

- 3.1 Defining the System, System Owner, System User, System Designers and system Builders, System Analysts, Variations on the System Analyst title, System life Cycle,
- 3.2 **Joint Application Development (JAD):** JAD definition, JAD purpose, JAD Philosophy, JAD Scope,
- 3.3 **Involved in a JAD:** Sponsor, Business Users, System Analyst
- 3.4 **Roles of JAD Group Member:** Project Leader, Record Keeper, Time Keeper.
- 3.5 **The System Design Environment:** Development Process, Management Process, System Structure, Basic Component of Computer based Information System, Personal/ Centralized/Distribution System.
- 3.6 **Concept formations:** Introduction, Finding the Problem , Evaluating the Proposal, Technical Feasibility, Operational Feasibility, Economic Feasibility.
- 3.7 **Requirements analysis:** Representing System Analysis Model , Requirement Model , Design Model,
- 3.8 **Development Process:** Design Method.
- 3.9 **Entity Relationship Diagram (E-R Diagram):** Notations, Entities: Strong Entities, Weak Entities, Attributes: Simple and Composite, Single Valued and Multiple Valued, Null and Derived Attribute.
- 3.10 **Relationship Sets:** Degree of Relationship and Cardinality Relationship, Specialization, Generalization, Aggregation.
- 3.11 **Data Flow Diagrams (DFDs):** Introductions, Data flow Diagram, Symbol, Files or data store, External entities, Data flows,
- 3.12 **Describing System by Data Flow Diagram:** Context diagram, Top level DFD, Expansion Level DFD , Conversions of Data.
- 3.13 **Object Modeling:** Object -Oriented Concept, Object Structure, Object Feature, Class and Object.
- 3.14 **Representation:** Association and Composition, Inheritance, Multiple Inheritances.
- 3.15 **Modeling:** Use Case Diagram, State Diagram, Event Flow Diagram.
- 3.16 **Documentation:** Automatic and Manual System.

4. Operating Systems

- 4.1 Define an Operating System ,Trace the Developments in Operating Systems ,Identify the functions of Operating Systems,
- 4.2 Describe the basic components of the Operating Systems, Understand Information Storage and Management Systems ,
- 4.3 List Disk Allocation and Scheduling Methods , Identify the Basic Memory Management strategies, List the Virtual Memory Management Techniques ,Define a Process and list the features of the Process Management System
- 4.4 Identify the Features of Process Scheduling, List the features of Inter-Process Communication and Deadlocks,
- 4.5 Identify the Concepts of Parallel and Distributed Processing ,Identify Security Threats to Operating Systems
- 4.6 Overview of the MS-DOS Operating System
- 4.7 Introduction to the Windows Family of Products, Unix Family of Products, Linux Family of Products.
- 4.8 Introduction to Windows Networking
- 4.9 Windows Architecture, Linux Architecture
- 4.10 Troubleshooting Windows ,& Linux
- 4.11 Managing Network Printing

- 4.12 Managing Hard Disks and Partitions
- 4.13 Monitoring and Troubleshooting Windows
- 4.14 Users, Groups and Permission Linux and Windows.

5. Database Management System and Design

- 5.1 Introduction, A Database Model, Relational Database Model, Integrity, RDBMS.
- 5.2 SQL and Embedded SQL
- 5.3 Writing Basic SQL SELECT Statements
- 5.4 Restricting and Sorting data
- 5.5 Single Row Functions
- 5.6 Displaying Data from Multiple Tables
- 5.7 Aggregation Data Using Group Functions
- 5.8 Sub Queries, Manipulating Data and Creating & Managing Tables
- 5.9 Creating Views and Controlling User Access
- 5.10 Using Set Operators, Datetime Function
- 5.11 **Database Design:** Logical Design, Conceptual Design, Mapping Conceptual to Logical, Pragmatic issues, Physical Design, Integrity and Correctness, Relational Algebra, Relational Calculus.
- 5.12 Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, DKNF
- 5.13 **Architecture of DBMS:** Client-server, Open Architectures, Transaction Processing, Multi-User & Concurrency, and Backup & Recovery Database.
- 5.14 **Basic Concept of major RDBMS products:** Oracle, Sybase, DB2, SQL Server and other Databases.

6. Programming Language

- 6.1 Overview of Programming Language: History, Programming Paradigms, The role of Language translates in the Programming Process.
- 6.2 Fundamental Issues in Language Design.
- 6.3 Virtual Machines, Code Generation, Loop Optimization.
- 6.4 Concept of Procedural Programming, Structural Programming, Object-Oriented Programming.
- 6.5 Concept of C programming, C++ Programming,
- 6.6 Java Programming for Declaration, Modularity and Storage Management Software Development.
- 6.7 Algorithm and Flowcharting
- 6.8 Constants and Variables
 - 6.8.1 Character Set
 - 6.8.2 Constants – needs & definition
 - 6.8.3 Variables – needs & definition
 - 6.8.4 Storage Classes
 - 6.8.5 Scope of Variables
- 6.9 Expression and Operations
 - 6.9.1 Operators: Assignment, Arithmetic, Increment, Decrement, Relational, Logical, Bitwise, SizeOf, Conditional
 - 6.9.2 Expression
 - 6.9.3 Evaluation & Assignment of Expression
- 6.10 Basic Input & Output Functions
- 6.11 Jumping, Branching and Looping Statements
- 6.12 Arrays

- 6.13 Built-in Functions: Arithmetic functions, Data Conversion functions, String functions, Character Classification functions
- 6.14 Structure Union & Enumerated data types
- 6.15 User Defined Functions
 - 22.1 Call by value
 - 22.2 Passing Structure & Array
 - 22.3 Recursion
- 6.16 Pointers
- 6.17 Program Bugs and Testing
 - 6.17.1 Program Bugs
 - 6.17.2 Preparing Test data
 - 6.17.3 Functional & Structural Testing

7. Networking

- 7.1 **Basic Network Theory:** Network Definition, Network Models, Connectivity, Network Addressing.
- 7.2 **Network Connectivity:** The Data Package, Establishing a Connection, Reliable Delivery, Network Connectivity, Noise Control, Building Codes, Connection Devices.
- 7.3 **Advanced Network Theory:** The OSI model, Ethernet, Network Resources, Token ring, FDDI, Wireless Networking.
- 7.4 **Common Network Protocols:** Families of Protocols, NetBEUI, Bridge and Switches, The TCP/IP Protocol, Building TCP/IP Network, The TCP/IP Suite
- 7.5 **TCP/IP Services:** Dynamic Host Configuration Protocol, DNS Name Resolution, NetBIOS support, SNMP, TCP/IP Utilities, FTP
- 7.6 **Network LAN Infrastructure:** LAN Protocols on a Network, IP Routing, IP Routing Tables, Router Discovery Protocols, Data Movement in a Routed Network, Virtual LANs(VLANS)
- 7.7 **Network WAN Infrastructure:** The WAN Environment, Wan Transmission Technologies, Wan Connectivity Devices, Voice Over Data Services
- 7.8 **Remote Networking:** Remote Networking, Remote Access protocols, VPN Technologies.
- 7.9 **Computer Security:** Computer Virus, Worm, Trojan Horse.
- 7.10 **Network Security:** Introduction, Virus Protection, Local Security, Network Access, Internet Security.
- 7.11 **Disaster Recovery:** The need for Disaster Recovery, Disaster Recovery plan, Data backup, Fault Tolerance.
- 7.12 **Advanced Data Storage Techniques:** Enterprise Data Storage, Clustering, Network Attached Storage, Storage Area Networks.
- 7.13 **Network Troubleshooting:** Using Systematic Approach to Troubleshooting.
- 7.14 **Network Support Tools:** Utilities, The Network Baseline.
- 7.15 Network Access Points (NAP), Common Network Component, Common Peripheral Ports.

8. Computer Architecture & Organization

- 8.1 Evaluation of Computers, Design Methodology, Set Architecture, MIPS ISA, ALU Design.
- 8.2 **Datapath Design:** Single and Multiple Cycle Implementations, Pipelining, Memory Hierarchy, Input/Output System: Bus & Role of Operating System.

9. Compiler Design

- 9.1 Introduction to Compiling,
- 9.2 Logical Analysis, Syntax Analysis, Semantic Analysis,
- 9.3 Run Time environment,
- 9.4 Intermediate Code Generation, Code Optimization,
- 9.5 Compiler Generation Tools.

10. E-Commerce Technology

- 10.1 Introduction to E-Commerce.
- 10.2 Electronic Commerce Strategies.
- 10.3 Electronic Commerce Security Issues.
- 10.4 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. MIS and Web Engineering

- 11.1 Information Systems, Client-Server Computing.
- 11.2 Information Systems and Decision Making.
- 11.3 Database Design issues, Data Mining, Data Warehousing
- 11.4 Knowledge Management, The strategic use of Information Technology.
- 11.5 Work Process Redesign (Reengineering) with Information Technology, Enterprise Resources Planning Systems, Information Systems Security, Information Privacy, and Global Information Technology issues.
- 11.6 Software Supported Demonstrations including advanced Spreadsheet topics, Software Component Based Systems(CBSE),
- 11.7 Multimedia
- 11.8 Object-Oriented Programming with COMS & DECOMS ,
- 11.9 Group Decision Support Systems
- 11.10 Basics of Website Design.

12. IT in Nepal

- 12.1 History of IT in Nepal,
- 12.2 IT Policy of Nepal, 2057 B.S.
- 12.3 Cyber law of Nepal (Electronic Transaction Ordinance, 2061 B.S.)
- 12.4 Copy Write Act, 2022 B.S.
- 12.5 Uses of Computers and Software Development
- 12.6 Nepali Unicode, Nepali Fonts
- 12.7 Licensing Issues