लोक सेवा आयोग

नेपाल विविध सेवा, राजपत्राङ्कित तृतीय श्रेणी, कम्प्युटर अधिकृत पदको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

द्वितीय पत्र (Paper II): Technical Subject

Section A– 30 Marks

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, system unit, Starting the computers
   - 1.5 Input Devices: keyboard, mouse, other input devices
   - 1.6 Processing: CPU, Memory
   - 1.7 Storages devices: Overview of Storage Devices, Floppy Disk Drive, Hard Drive, 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: Windows Desktop, Program Manager, Organizing the Desktop, File Manager
   - 1.11 pplication 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. **Programming Language**
   - 3.1 Overview of Programming Language: History, Programming Paradigms, The role of Language translates in the Programming Process.
   - 3.2 Fundamental Issues in Language Design.
   - 3.3 Virtual Machines, Code Generation, Loop Optimization.
   - 3.4 Concept of Procedural Programming, Structural Programming, Object-Oriented Programming.
   - 3.5 Concept of C programming, C++ Programming,
   - 3.6 Java Programming for Declaration, Modularity and Storage Management Software Development

Section B– 20 Marks

4. **System Analysis and Design**
   - 4.1 Definition of the System, System Owner, System User, System Designers and system Builders, System Analysts, Variations on the System Analyst title, System life Cycle
   - 4.2 Joint Application Development (JAD): JAD definition, JAD purpose, JAD Philosophy, JAD Scope
   - 4.3 Involved in a JAD: Sponsor, Business Users, System Analyst
   - 4.4 Roles of JAD Group Member: Project Leader, Record Keeper, Time Keeper.
   - 4.5 System Design Environment: Development Process, Management Process, System Structure, Basic Component of Computer based Information System, Personal/ Centralized/Distribution System
   - 4.6 Concept formations: Introduction, Finding the Problem, Evaluating the Proposal, Technical Feasibility, Operational Feasibility, Economic Feasibility.
   - 4.7 Requirements analysis: Representing System Analysis Model, Requirement Model, Design Model
   - 4.8 Development Process: Design Method
   - 4.9 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
   - 4.10 Relationship Sets: Degree of Relationship and Cardinality Relationship, Specialization, Generalization, Aggregation
   - 4.11 Data Flow Diagrams (DFDs): Introductions, Data flow Diagram, Symbol, Files or data store, External entities, Data flows
   - 4.12 Describing System by Data Flow Diagram: Context diagram, Top level DFD, Expansion Level DFD, Conversions of Data
   - 4.13 Object Modeling: Object -Oriented Concept, Object Structure, Object Feature, Class and Object
   - 4.14 Representation: Association, Composition, Inheritance, Multiple Inheritances
   - 4.15 Modeling: Use Case Diagram, State Diagram, Event Flow Diagram.
   - 4.16 Documentation: Automatic and Manual System

Section C– 20 Marks

5. **Operating Systems**
   - 5.1 Definittion, Development and Functions of Operating Systems
   - 5.2 Basic components of the Operating Systems, Information Storage and Management Systems
   - 5.3 Disk Allocation and Scheduling Methods, Basic Memory Management strategies, Virtual Memory Management Techniques, Define a Process and features of the Process Management System
   - 5.4 Features of Process Scheduling; List the features of Inter-Process Communication and Deadlocks
   - 5.5 Concepts of Parallel and Distributed Processing, Identify Security Threats to Operating Systems
   - 5.6 Overview of the MS-DOS Operating System
   - 5.7 Introduction to the Windows Family of Products, Unix Family of Products, Linux Family of Products
   - 5.8 Introduction to Windows Networking
   - 5.9 Windows Architecture, Linux Architecture

5.10 Troubleshooting Windows & Linux
5.11 Managing Network Printing
5.12 Managing Hard Disks and Partitions
5.13 Monitoring and Troubleshooting Windows
5.14 Users, Groups and Permission Linux and Windows

6. **Database Management System and Design**
6.1 Introduction, A Database Model, Relational Database Model, Integrity, RDBMS
6.2 SQL and Embedded SQL
6.3 Writing Basic SQL SELECT Statements
6.4 Restricting and Sorting data
6.5 Single Row Functions
6.6 Displaying Data from Multiple Tables
6.7 Aggregation Data Using Group Functions
6.8 Sub Queries, Manipulating Data and Creating &Managing Tables
6.9 Creating Views and Controlling User Access
6.10 Using Set Operators, Datetime Function
6.11 Database Design: Logical Design, Conceptual Design, Mapping Conceptual to Logical, Pragmatic issues, Physical Design, Integrity and Correctness, Relational Algebra, Relational Calculus
6.12 Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, DKNF
6.13 Architecture of DBMS: Client-server, Open Architectures, Transaction Processing, Multi-User & Concurrency, and Backup & Recovery Database
6.14 Basic Concept of major RDBMS products: Oracle, Sybase, DB2, SQL Server and other Databases

Section D– 30 Marks

7. Networking
7.1 Basic Network Theory: Network Definition, Network Models, Connectivity, Network Addressing.
7.2 Network Connectivity: Data Package, Establishing a Connection, Reliable Delivery, Network Connectivity, Noise Control, Building Codes, Connection Devices
7.3 Advanced Network Theory: OSI model, Ethernet, Network Resources, Token ring, FDDI, Wireless Networking
7.4 Common Network Protocols: Families of Protocols, NetBEUI, Bridge and Switches, TCP/IP Protocol, Building TCP/IP Network, 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: 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: 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, Network Baseline
7.15 Network Access Points, 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. Complier 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

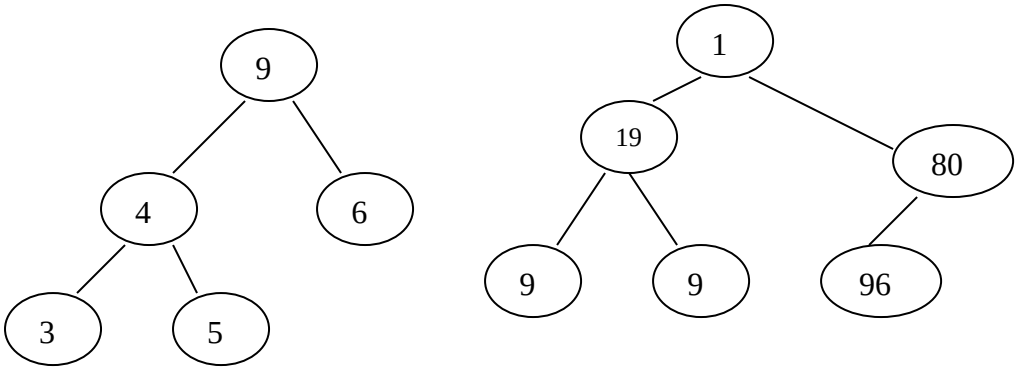
12. IT in Nepal

12.1 History of IT in Nepal
12.2 IT Policy of Nepal
12.3 Electronic Transaction Act
12.4 Copyright Act
12.5 Uses of Computers and Software Development

12.6 Nepali Unicode, Nepali Fonts
12.3 Licensing Issues

विषयगत नमूना प्रश्नहरु (Sample questions)

1) Merge operation between two heap trees



H1: A max Heap H2: A min Heap

2) Preorder and postorder traversals of a binary tree given as below:

Preorder: u1 u2 u3 u4 u10 u8 u5 u9 u6 u11 u7

Postorder: u4 u10 u3 u8 u2 u9 u11 u7 u6 u5 u1

Obtained a binary tree, which resembles with traversals ?

3) Use the do-while loops in nested form and produces the following output in Java.

Multiple Tables

1	2	3
2	4	6
3	6	9

4) Using C program Draw Result

1	2
2	3
3	4
4	5

5) Consider the following schema:

Suppliers (sid:interger, sname:srting, address: string)
Parts(pid: integer, pname: string, color: string)
Catalog (sid: integer, pid:integer, cost: real)
The key fields are underline, and the domain of each field is listed after the field name. Thus sid is the key for suppliers, pid is the key for parts, and sid and pid together form the key Catalog. The catalog relation list the prices charged for parts by suppliers. Write the following queries in relational algebra, SQL

- *Find the Name of the suppliers who supply red part.*

Solution:

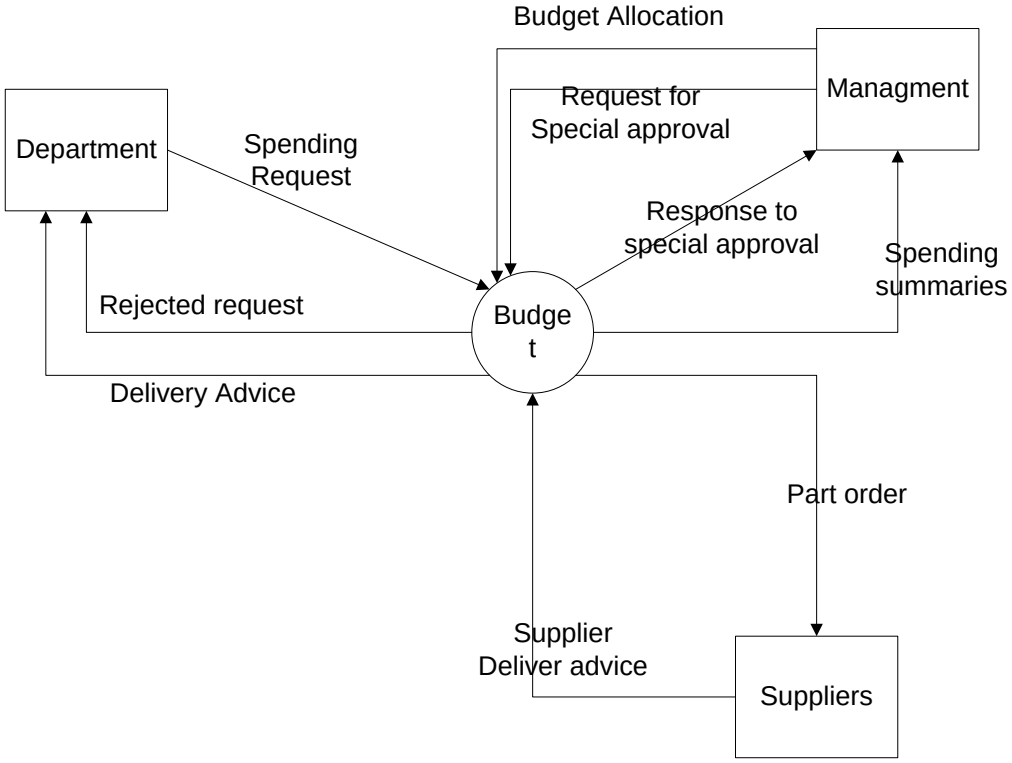
a. Relational algebra

$\Pi_{sname}(\Pi_{sid}((\Pi_{pid}\, \sigma_{color='red'} Parts) \infty Catalog) \infty Suppliers)$

b. SQL

SELECT S.sname
FROM Suppliers S, Parts P, Catalog C
WHERE P.color='red' AND C.pid=P.pid AND C.sid=S.sid

6) Develop Top level DFD from Context Diagram



प्रयोगात्मक परीक्षाका नमूना प्रश्नहरु

1. Get IP address from given computers which are Network.
   a. Give privileged share only database administration.
   b. Determine if the following address are on local or remote network.
   Node 1: 192.255.16.8
   Node2: 192.225.14.8
   Mask: 255.255.255.0
2. Create tables Student, Teacher, Course is SQL .
   Student (Sid, Sname, subject, level)
   Teacher (Tid, Tname, subject,)
   Course (Cid, Cnumber, Tname, level)
   a. Insert 10 values
   b. Delete first two values.
3. Given a string
   String S("123456789")
   Write a program in C++ that displays the following:

1
232
34543
4567654
567898765

लोक सेवा आयोग
नेपाल विविध सेवा, राजपत्राङ्कित तृतीय श्रेणी, कम्प्युटर अधिकृत पदको खुला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र
लिइने **सामूहिक परीक्षण (Group Test)** को लागि

सामूहिक छलफल (Group Discussion)

यस प्रयोजनको लागि गरिने परीक्षण १० पूर्णाङ्क र ३० मिनेट अवधिको हुनेछ जुन नेताविहिन सामूहिक छलफल (Leaderless Group Discussion) को रुपमा अवलम्वन गरिने छ । दिइएको प्रश्न वा Topic का विषयमा पालैपालोसँग निर्दिष्ट समयभित्र समूहवीच छलफल गर्दै प्रत्येक उम्मेदवारले व्यक्तिगत प्रस्तुति (Individual Presentation) गर्नु पर्नेछ । यस परीक्षणमा मूल्याङ्कनको लागि देहाय अनुसारको ३ जनाको समिति रहनेछ ।

आयोगका अध्यक्ष वा सदस्य	-	अध्यक्ष
मनोविज्ञ	-	सदस्य
दक्ष/विज्ञ (१ जना)	-	सदस्य

सामूहिक छलफलमा दिइने नमुना प्रश्न वा Topic

उदाहरणको लागि - उर्जा संकट, गरीबी निवारण, स्वास्थ्य बीमा, खाद्य सुरक्षा, प्रतिभा पलायन जस्ता Topics मध्ये कुनै एक Topic मात्र दिइनेछ ।