

कर्मचारी सञ्चय कोष
सातौं तह उप प्रबन्धक (सूचना प्रविधि) पदका लागि

सेवा : प्राविधिक

समूह : सूचना प्रविधि

उपसमूह :

तह : सातौं

पद : उप प्रबन्धक (सूचना प्रविधि)

किसिम : आन्तरिक प्रतियोगिता

पाठ्यक्रम योजनालाई निम्नानुसारका दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :- लिखित परीक्षा:

पूर्णाङ्क :- २००

द्वितीय चरण : - अन्तर्वार्ता

पूर्णाङ्क :- ३०

परीक्षा योजना (Examination Scheme)

प्रथम चरण : लिखित परीक्षा (Written Examination)

पूर्णाङ्क :- २००

पत्र	विषय	खण्ड	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली		प्रश्नसंख्या × अङ्क	समय
प्रथम	प्राविधिक विषय तथा व्यवस्थापन	प्राविधिक विषय	१००	४०	वस्तुगत	बहुवैकल्पिक प्रश्न	५० प्रश्न × १ अङ्क	४५ मिनेट
		व्यवस्थापन, सामाजिक सुरक्षा प्रणाली तथा विविध			विषयगत	छोटो उत्तर	१० प्रश्न × ५ अङ्क	१ घण्टा ३० मिनेट
द्वितीय	सेवा सम्बन्धी (प्राविधिक विषय)		१००	४०	विषयगत	लामो उत्तर	१० प्रश्न × १० अङ्क	३ घण्टा

(ख) द्वितीय चरण : अन्तर्वार्ता (Interview)

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	३०	मौखिक

द्रष्टव्य:

- लिखित परीक्षाको भाषा नेपाली वा अंग्रेजी वा दुवै हुन सक्नेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- लिखित परीक्षामा सोधिने प्रश्न संख्या र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा दिईए अनुसार हुनेछ ।
- वस्तुगत बहुवैकल्पिक (Multiple choice) प्रश्नहरूको गलत उत्तर दिएमा प्रत्येक गलत उत्तर वापत २० प्रतिशत अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस वापत अङ्क दिईने छैन र अङ्क कट्टा गरिने पनि छैन ।
- वस्तुगत बहुवैकल्पिक हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षर (Capital Letter) A, B, C, D मा लेख्नु पर्नेछ । सानो अक्षर (Small Letter) लेखेको वा अन्य कुनै संकेत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ ।
- बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्यालकुलेटर (Calculator) प्रयोग गर्न पाईने छैन ।
- विषयगत प्रश्नहरूको हकमा एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुईभन्दा बढी भाग (Two or more parts of a single question) वा एउटै प्रश्न अन्तर्गत दुई वा बढी टिप्पणी (Short note) सोध्न सकिनेछ ।
- विषयगत प्रश्न हुने पत्र/विषयका प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन । परीक्षार्थीले प्रत्येक खण्डका प्रश्नको उत्तर सोही खण्डको उत्तर पुस्तिकामा लेख्नुपर्नेछ ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जुनसुकै कुरा लेखिएको भएता पनि पाठ्यक्रममा परेका कानून, ऐन, नियम, विनियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरि संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनुपर्छ ।
- प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराईनेछ ।
- पाठ्यक्रम स्वीकृत मिति :- २०८०/०१/२१

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पाठ्यक्रमको विस्तृत विवरण
प्रथम पत्र : प्राविधिक विषय तथा व्यवस्थापन

खण्ड (क) : ५० अङ्क
(प्राविधिक विषय)

1. Computer Architecture (5 Marks)

- 1.1 Basic Structures : sequential circuits, design procedure, state table and state diagram, Von Neumann / Harvard architecture, RISC/CISC architecture
- 1.2 Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction cycle and excitation cycle
- 1.3 Processing Unit: instruction formats, arithmetic and logical instruction
- 1.4 Addressing modes
- 1.5 Input Output Organization : I/O programming , memory mapped I/O, basic interrupt system, Direct Memory Access (DMA)
- 1.6 Arithmetic Operations
- 1.7 Memory Systems

2. Operating System (5 Marks)

- 2.1 Processes and Threads: Symmetric Multiprocessing, Micro- kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock
- 2.2 Scheduling
- 2.3 Memory Management
- 2.4 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
- 2.5 Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters
- 2.6 Security : Authentication and Access Authorization, System Flaws and Attacks, Trusted system

3. Computer Networks (5 Marks)

- 3.1 Protocol stack, OSI and TCP/IP models
- 3.2 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
- 3.3 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
- 3.4 Transport Layer: principles, multiplexing and demultiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control

कर्मचारी सञ्चय कोष
सातौं तह उप प्रबन्धक (सूचना प्रविधि) पदका लागि

- 3.5 Application Layer : Web and Web caching, FTP (File Transfer Protocol), Electronic mail, DNS (Domain Name Service), socket programming
4. **Structured and Object Oriented Programming (5 Marks)**
- 4.1 Concept of Procedural Programming, Structural Programming, Object- Oriented Programming
 - 4.2 Data types, Abstract Data Types (ADT)
 - 4.3 Operators, variables and assignments
 - 4.4 Control structures
 - 4.5 Procedure/function
 - 4.6 Class definitions, encapsulation, inheritance, object composition, polymorphism
 - 4.7 Concept of C programming, C++ Programming
5. **Database Management System (5 Marks)**
- 5.1 The relational model, ER model
 - 5.2 Structured Query Language (SQL)
 - 5.3 Functional dependency, normalization and relational database design,
 - 5.4 Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, Concurrency control techniques
 - 5.5 Crash Recovery : types of failure, Recovery techniques
 - 5.6 Query Processing and Optimization
 - 5.7 Indexing : Hash based indexing, Tree based indexing
 - 5.8 Distributed Database Systems and Object oriented database system
 - 5.9 Data Mining and Data Warehousing
 - 5.10 Database Security
6. **Software Engineering (5 Marks)**
- 6.1 Software process: The software lifecycle models, risk-driven approaches
 - 6.2 Software project management: Relationship to lifecycle, project planning, project control, project organization, risk management, cost models, configuration management, version control, quality assurance, metrics
 - 6.3 Software requirements: Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review, feasibility analysis
 - 6.4 Software design: Design for reuse and with reuse, design for change, design notations, design evaluation and validation
 - 6.5 Implementation: Programming standards and procedures, modularity, data abstraction, static analysis, unit testing, integration testing, regression testing, tools for testing, fault tolerance
 - 6.6 Maintenance: The maintenance problem, the nature of maintenance, planning for maintenance
 - 6.7 SE issues: Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI-CMM, CASE tools

कर्मचारी सञ्चय कोष
सातौं तह उप प्रबन्धक (सूचना प्रविधि) पदका लागि

7. **Information Systems and Web Engineering (5 Marks)**
 - 7.1 Information Systems and Decision Making; Knowledge Management.
 - 7.2 The strategic use of Information Technology; Work Process Redesign (Reengineering) with Information Technology; Enterprise Resources Planning Systems
 - 7.3 Information Systems Security, Information Privacy, and Global Information Technology issues
 - 7.4 Introduction to Web Technology: Internet, Intranet, WWW, Static and Dynamic Web Page; Web Clients; Web Servers; Client Server Architecture: Single Tier, Two-Tier, Multi-Tier; HTTP: HTTP Request and Response; URL, Client Side Scripting, Server Side Scripting, Web 2.0
 - 7.5 Hyper Text Markup Language: Introduction to HTML; Elements of HTML Document; HTML Elements and HTML Attributes, Headings, Paragraph, Division, Formatting; Image element; Anchors; Lists; Tables; Frames; Forms
 - 7.6 Client Side Scripting with JavaScript
 - 7.7 Basics of AJAX; Introduction to XML and its Application
8. **Data Structure and Algorithms (5 Marks)**
 - 8.1 General concepts : Abstract data Type, Time and space analysis of algorithms, Big oh and theta notations, Average, best and worst case analysis
 - 8.2 Linear data structures
 - 8.3 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
 - 8.4 Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
 - 8.5 Hashing
 - 8.6 Graphs and digraphs
 - 8.7 Sorting
9. **Artificial Intelligence (5 Marks)**
 - 9.1 Search: Uninformed search techniques - depth first search, breadth first search, depth limit search, and search strategy comparison; Informed search techniques - hill climbing, best first search, greedy search
 - 9.2 Learning: Supervised Learning; Unsupervised Learning; Semi-supervised Learning; Reinforcement Learning; Neural Networks; Support Vector Machine (SVM); Self Organizing Map (SOM); Genetic Algorithms; Clustering; Decision Trees.
 - 9.3 Automated reasoning: FOPL; Knowledge Representation Languages. Basic Concepts of Natural Language Processing (NLP)
 - 9.4 Game Playing
10. **Advanced Topics in IT (5 Marks)**
 - 10.1 Parallel and distributed computing
 - 10.2 High speed networks
 - 10.3 Software Architecture
 - 10.4 Cryptography and network security

कर्मचारी सञ्चय कोष
सातौं तह उप प्रबन्धक (सूचना प्रविधि) पदका लागि

- 10.5 E-commerce
- 10.6 Software Project Management
- 10.7 Cloud Computing
- 10.8 Big Data Analytics
- 10.9 Internet of Things (IoT)
- 10.10 Machine Learning

खण्ड (ख) : ५० अङ्क
(व्यवस्थापन, सामाजिक सुरक्षा प्रणाली तथा विविध)

11. **व्यवस्थापन (२० अङ्क)**
 - 11.1 व्यवस्थापनको परिचय, सिद्धान्तहरू, कार्य, उपयोग चुनौती
 - 11.2 व्यवस्थापनका नवोदित अवधारणाहरू (Emerging concepts of management)
 - 11.3 कार्य उत्प्रेरणा, नेतृत्व तथा निर्णय प्रक्रियाको अभ्यास
 - 11.4 मानव संसाधन व्यवस्थापन, ट्रेड यूनियन, सामूहिक सौदाबाजी र गुनासो व्यवस्थापन
 - 11.5 संस्थागत सुशासन र आन्तरिक नियन्त्रण प्रणाली
 - 11.6 व्यवस्थापन सूचना प्रणाली
 - 11.7 सार्वजनिक सेवा प्रवाह र यसका नविनतम अभ्यास
12. **सामाजिक सुरक्षा प्रणाली (२० अङ्क)**
 - 12.1 कर्मचारी सञ्चय कोष र यसको कार्यक्षेत्र, रणनीतिक योजना र भावी कार्यक्रम
 - 12.2 सामाजिक सुरक्षा प्रणालीको अन्तर्राष्ट्रिय अभ्यास र मान्यता
 - 12.3 सामाजिक सुरक्षा, सामाजिक संरक्षण र नेपालमा यसको अवस्था
 - 12.4 सामाजिक सुरक्षा प्रणालीमा कर्मचारी सञ्चय कोषको योगदान
 - 12.5 अन्तर्राष्ट्रिय श्रम संगठन र अन्तर्राष्ट्रिय सामाजिक सुरक्षा संस्था (International Social Security Association - ISSA)
13. **विविध (१० अङ्क)**
 - 13.1 नेपालको संविधान
 - 13.2 कर्मचारी सञ्चय कोष ऐन, २०१९
 - 13.3 निवृत्तभरण कोष ऐन, २०७५
 - 13.4 विद्युतीय कारोवार ऐन, २०६३
 - 13.5 कर्मचारी सञ्चय कोष, कर्मचारी सेवा शर्त नियमावली, २०७८
 - 13.6 कर्मचारी सञ्चय कोष, सूचना तथा सञ्चार प्रविधि नीति, २०७२

प्रथम पत्रमा पाठ्यक्रमका खण्डबाट लिखित परीक्षामा यथासम्भव देहाय बमोजिम प्रश्नहरू सोधिनेछ ।

खण्ड	इकाई	प्रश्नसंख्या × अङ्क	प्रश्नका किसिम
क	-	५० प्रश्न × १ अङ्क = ५०	वस्तुगत बहुवैकल्पिक प्रश्न
ख	११	४ प्रश्न × ५ अङ्क = २०	विषयगत प्रश्न
	१२	४ प्रश्न × ५ अङ्क = २०	
	१३	२ प्रश्न × ५ अङ्क = १०	

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द्वितीय पत्र :

सेवा सम्बन्धी (प्राविधिक विषय)

खण्ड (क) : ५० अङ्क

1. **Computer Architecture (10 Marks)**
 - 1.1 Basic Structures : sequential circuits, design procedure, state table and state diagram, Von Neumann / Harvard architecture, RISC/CISC architecture
 - 1.2 Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction cycle and excitation cycle
 - 1.3 Processing Unit: instruction formats, arithmetic and logical instruction
 - 1.4 Addressing modes
 - 1.5 Input Output Organization : I/O programming , memory mapped I/O, basic interrupt system, Direct Memory Access (DMA)
 - 1.6 Arithmetic Operations
 - 1.7 Memory Systems
2. **Operating System (10 Marks)**
 - 2.1 Processes and Threads : Symmetric Multiprocessing, Microkernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock
 - 2.2 Scheduling: Concept and algorithms
 - 2.3 Memory Management
 - 2.4 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
 - 2.5 Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters
 - 2.6 Security : Authentication and Access Authorization, System Flaws and Attacks, Trusted system
3. **Computer Networks (10 Marks)**
 - 3.1 Protocol stack, OSI and TCP/IP models
 - 3.2 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
 - 3.3 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
 - 3.4 Transport Layer: principles, multiplexing and demultiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control
 - 3.5 Application Layer : Web and Web caching, FTP (File Transfer Protocol), Electronic mail, DNS (Domain Name Service), socket programming
4. **Structured and Object Oriented Programming (10 Marks)**
 - 4.1 Concept of Procedural Programming, Structural Programming, Object- Oriented Programming
 - 4.2 Data types, Abstract Data Types (ADT)
 - 4.3 Operators, variables and assignments
 - 4.4 Control structures

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- 4.5 Procedure/function
- 4.6 Class definitions, encapsulation, inheritance, object composition, polymorphism
- 4.7 Concept of C programming, C++ Programming

5. Database Management System (10 Marks)

- 5.1 The relational model, ER model
- 5.2 Structured Query Language (SQL)
- 5.3 Functional dependency, normalization and relational database design,
- 5.4 Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, Concurrency control techniques
- 5.5 Crash Recovery : types of failure, Recovery techniques
- 5.6 Query Processing and Optimization
- 5.7 Indexing : Hash based indexing, Tree based indexing
- 5.8 Distributed Database Systems and Object oriented database system
- 5.9 Data Mining and Data Warehousing
- 5.10 Database Security

खण्ड (ख) : ५० अङ्क

6. Software Engineering (10 Marks)

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

7. Information Systems and Web Engineering (10 Marks)

- 7.1 Information Systems and Decision Making; Knowledge Management.
- 7.2 The strategic use of Information Technology; Work Process Redesign (Reengineering) with Information Technology; Enterprise Resources Planning Systems
- 7.3 Information Systems Security, Information Privacy, and Global Information Technology issues
- 7.4 Introduction to Web Technology: Internet, Intranet, WWW, Static and Dynamic Web Page; Web Clients; Web Servers; Client Server Architecture: Single Tier, Two-Tier, Multi-Tier; HTTP: HTTP Request and Response; URL, Client Side Scripting, Server Side Scripting, Web 2.0
- 7.5 Hyper Text Markup Language: Introduction to HTML; Elements of HTML Document; HTML Elements and HTML Attributes, Headings, Paragraph, Division, Formatting; Image element; Anchors; Lists; Tables; Frames; Forms

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- 7.6 Client Side Scripting with JavaScript
7.7 Basics of AJAX; Introduction to XML and its Application
8. **Data Structure and Algorithms (10 Marks)**
8.1 General concepts : Abstract data Type, Time and space analysis of algorithms, Big oh and theta notations, Average, best and worst case analysis
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8.3 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
8.4 Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
8.5 Hashing
8.6 Graphs and digraphs
8.7 Sorting
9. **Artificial Intelligence (10 Marks)**
9.1 Search: Uninformed search techniques- depth first search, breadth first search, depth limit search, and search strategy comparison; Informed search techniques- hill climbing, best first search, greedy search
9.2 Learning: Supervised Learning; Unsupervised Learning; Semi-supervised Learning; Reinforcement Learning; Neural Networks; Support Vector Machine (SVM); Self Organizing Map (SOM); Genetic Algorithms; Clustering; Decision Trees.
9.3 Automated reasoning: FOPL; Knowledge Representation Languages. Basic Concepts of Natural Language Processing (NLP)
9.4 Game Playing
10. **Advanced Topics in IT (10 Marks)**
10.1 Parallel and distributed computing
10.2 High speed networks
10.3 Software Architecture
10.4 Cryptography and network security
10.5 E-commerce
10.6 Software Project Management
10.7 Cloud Computing
10.8 Big Data Analytics
10.9 Internet of Things (IoT)
10.10 Machine Learning

द्वितीय पत्रमा पाठ्यक्रमका खण्डबाट लिखित परीक्षामा यथासम्भव देहाय बमोजिम प्रश्नहरू सोधिनेछ ।

खण्ड	प्रश्न संख्या र अङ्क भार	कैफियत
क	५ प्रश्न × १० अङ्क = ५०	प्रत्येक इकाईबाट एक प्रश्न
ख	५ प्रश्न × १० अङ्क = ५०	