कर्मचारी सञ्चय कोष
छैठौं तह सहायक प्रबन्धक (कम्प्युटर इन्जिनियर) पदका लागि

सेवा : प्राविधिक   समूह : कम्प्युटर   उपसमूह :

तह : छैठौं   पद : सहायक प्रबन्धक (कम्प्युटर इन्जिनियर)   किसिम : खुला प्रतियोगिता

पाठ्यक्रम योजनालाई निम्नानुसारका दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :- लिखित परीक्षाः   पूर्णाङ्क :- २००
द्वितीय चरण : - अन्तर्वार्ता   पूर्णाङ्क :- ३०

परीक्षा योजना (Examination Scheme)

प्रथम चरण : लिखित परीक्षा (Written Examination)   पूर्णाङ्क :- २००

पत्र	विषय	खण्ड	पूर्णाङ्क	उतीर्णाङ्क	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×१०अङ्क	३ घण्टा

(ख) द्वितीय चरण : अन्तर्वार्ता (Interview)

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	३०	मौखिक

द्रष्टव्य:

१. लिखित परीक्षाको भाषा नेपाली वा अंग्रेजी वा दुवै हुन सक्नेछ ।

२. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।

३. लिखित परीक्षामा सोधिने प्रश्न संख्या र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा दिईए अनुसार हुनेछ ।

४. वस्तुगत बहुवैकल्पिक (Multiple choice) प्रश्नहरुको 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 ।

५. 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 ।

६. बहुवैकल्पिक प्रश्नहरु हुने परीक्षामा कुनै प्रकारको क्यालकुलेटर (Calculator) प्रयोग गर्न पाईने छैन ।

७. विषयगत प्रश्नहरुको हकमा एउटा लामो प्रश्न वा एउटै प्रश्नका दई वा दुईभन्दा बढी भाग (Two or more parts of a single question) वा एउटै प्रश्न अन्तर्गत दुई वा वढी टिप्पणी (Short note) सोध्न सकिनेछ ।

८. विषयगत प्रश्न हुने पत्र/विषयका प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परीक्षार्थीले प्रत्येक खण्डका प्रश्नको उत्तर सोही खण्डको उत्तर पुस्तिकामा लेख्नुपर्नेछ ।

९. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयबस्तुमा 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 ।

१०. प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराईनेछ ।

११. पाठ्यक्रम स्वीकृत मिति :- २०८०/०१/२१

पाठ्यक्रमको विस्तृत विवरण
प्रथम पत्र : प्राविधिक विषय तथा व्यवस्थापन
खण्ड (क) : ५० अङ्क
(प्राविधिक विषय)

1. **Computer Architecture**
   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. **Basic Electrical, Electronics and Digital Design**
   2.1 Basic Circuit Theory, AC circuit Fundamentals
   2.2 Magnetic circuits and Transformers
   2.3 Transient Analysis, Filters
   2.4 Semiconductors, Diodes and Diode Circuits, Transistors
   2.5 Transistor modeling, Biasing and Amplification
   2.6 Small Signal amplifiers and frequency response
   2.7 Large signal amplifiers, feedback amplifiers and Oscillators
   2.8 Operational amplifiers
   2.9 Digital and Analog Systems. Number Systems.
   2.10 Logic Elements, Combinational and Sequential Logic Circuits
   2.11 Arithmetic Circuits
   2.12 Counters and Registers
   2.13 IC logic families
   2.14 Interfacing with Analog Devices
   2.15 Memory Devices

3. **Operating System**
   3.1 Processes and Threads: Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock
   3.2 Scheduling: Concept and algorithms
   3.3 Memory Management
   3.4 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
   3.5 Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters
   3.6 Security : Authentication and Access Authorization, System Flaws and Attacks, Trusted system

4. **Computer Networks**
   4.1 Protocol stack, OSI and TCP/IP models

4.2 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

4.3 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

4.4 Transport Layer: principles, multiplexing and demultiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control

4.5 Application Layer : Web and Web caching, FTP (File Transfer Protocol), Electronic mail, DNS (Domain Name Service), socket programming

5. **Structured and Object Oriented Programming**
   5.1 Concept of Procedural Programming, Structural Programming, Object- Oriented Programming
   5.2 Data types, Abstract Data Types (ADT)
   5.3 Operators, variables and assignments
   5.4 Control structures
   5.5 Procedure/function
   5.6 Class definitions, encapsulation, inheritance, object composition, polymorphism
   5.7 Concept of C programming, C++ Programming

6. **Software Engineering**
   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

7. **Database Management System**
   7.1 The relational model, ER model
   7.2 Structured Query Language (SQL)
   7.3 Functional dependency, normalization and relational database design,
   7.4 Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, Concurrency control techniques
   7.5 Crash Recovery : types of failure, Recovery techniques

   7.6   Query Processing and Optimization
   7.7   Indexing : Hash based indexing, Tree based indexing
   7.8   Distributed Database Systems and Object oriented database system
   7.9   Data Mining and Data Warehousing
   7.10 Database Security

8. **Data Structure and Algorithms**
   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: Concept and algorithms

9. **Artificial Intelligence**
   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**
    10.1 Parallel and distributed computing
    10.2 High speed networks
    10.3 Software Architecture
    10.4 Cyber 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

यस खण्डबाट देहाय बमोजिमको संख्यामा वस्तुगत बहुबैकल्पिक प्रश्नहरू सोधिनेछन् ।

Unit	1	2	3	4	5	6	7	8	9	10
No. of Questions	5	5	6	4	6	6	4	5	4	5

कर्मचारी सञ्चय कोष
छैठौं तह सहायक प्रबन्धक (कम्प्युटर इन्जिनियर) पदका लागि
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 परिवर्तन व्यवस्थापन तथा संगठनात्मक विकास (Change management and organizational development)

    11.4 नेतृत्व सीप र कार्य उत्प्रेरणा

    11.5 रणनीतिक व्यवस्थापनको धारणा ९ऋयलअभ्उत या कतचबतभनष्ण ऽबलबनफ्भलत०

    11.6 मानव संशाधन व्यवस्थापन (परिचय, भर्ना, कार्यसम्पादन मूल्याङ्कन, वृत्ति विकास, चुनौतीहरू)

    11.7 सामूहिक सौदावाजी

    11.8 सार्वजनिक व्यवस्थापनमा निर्देशन, नियन्त्रण, निर्णय प्रक्रिया, नेतृत्व, समन्वय, अधिकार प्रत्यायोजन तथा निक्षेपण र अनुगमन मूल्यांकन

    11.9 सूचना तथा संचार व्यवस्थापन प्रणाली

    11.10 सार्वजनिक सेवा प्रवाह

12. **सामाजिक सुरक्षा प्रणाली (१० 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 (२० अङ्क)**

    13.1 नेपालको संविधान

    13.2 सूचना तथा सञ्चार प्रविधि नीति,२०७२

    13.3 विद्युतीय कारोवार ऐन, २०६३

    13.4 कर्मचारी सञ्चयकोष ऐन, २०१९

    13.5 बैंक तथा वित्तीय संस्था सम्बन्धी ऐन, २०७३ का सान्दर्भिक विषयहरु

    13.6 योगदानमा आधारित सामाजिक सुरक्षा कोष ऐन, २०७४

    13.7 सार्वजनिक खरिद ऐन, २०६३ र सार्वजनिक खरिद नियमावली, २०६४

    13.8 कर्मचारी सञ्चय कोष (खरिद) नियमावली, २०७५

    13.9 कर्मचारी सञ्चय कोष, कर्मचारी सेवा शर्त नियमावली, २०७८

    13.10 सूचना तथा सञ्चार प्रविधि संग सम्बन्धित प्रमुख निकायका भूमिकाहरुः सञ्चार तथा सूचना प्रविधि मन्त्रालय, सूचना प्रविधि विभाग, नेपाल दूरसञ्चार प्राधिकरण, राष्ट्रिय सूचना प्रविधि केन्द्र (सरकारी एकिकृत डाटा सेन्टर)

छैठौं तह सहायक प्रबन्धक (कम्प्युटर इन्जिनियर) पदका लागि

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	२ प्रश्न × ५ अङ्क = १०	
	१३	४ प्रश्न × ५ अङ्क = २०	

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. **Basic Electrical, Electronics and Digital Design (10 Marks)**
    2.1 Basic Circuit Theory, AC circuit Fundamentals
    2.2 Magnetic circuits and Transformers
    2.3 Transient Analysis, Filters
    2.4 Semiconductors, Diodes and Diode Circuits, Transistors
    2.5 Transistor modeling, Biasing and Amplification
    2.6 Small Signal amplifiers and frequency response
    2.7 Large signal amplifiers, feedback amplifiers and Oscillators
    2.8 Operational amplifiers
    2.9 Digital and Analog Systems. Number Systems.
    2.10 Logic Elements, Combinational and Sequential Logic Circuits
    2.11 Arithmetic Circuits
    2.12 Counters and Registers
    2.13 IC logic families
    2.14 Interfacing with Analog Devices
    2.15 Memory Devices

3. **Operating System (10 Marks)**
    3.1 Processes and Threads: Symmetric Multiprocessing, Micro- kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock
    3.2 Scheduling: Concept and algorithms
    3.3 Memory Management

3.4 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

3.5 Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters

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

4. **Computer Networks (10 Marks)**
   4.1 Protocol stack, OSI and TCP/IP models
   4.2 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
   4.3 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
   4.4 Transport Layer: principles, multiplexing and de-multiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control
   4.5 Application Layer : Web and Web caching, FTP (File Transfer Protocol), Electronic mail, DNS (Domain Name Service), socket programming

5. **Structured and Object Oriented Programming (10 Marks)**
   5.1 Concept of Procedural Programming, Structural Programming, Object- Oriented Programming
   5.2 Data types, Abstract Data Types (ADT)
   5.3 Operators, variables and assignments
   5.4 Control structures
   5.5 Procedure/function
   5.6 Class definitions, encapsulation, inheritance, object composition, polymorphism
   5.7 Concept of C programming, C++ Programming

<div align="center">खण्ड (ख)   : ५० अङ्क</div>

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. **Database Management System (10 Marks)**
    7.1   The relational model, ER model
    7.2   Structured Query Language (SQL)
    7.3   Functional dependency, normalization and relational database design,
    7.4   Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, Concurrency control techniques
    7.5   Crash Recovery : types of failure, Recovery techniques
    7.6   Query Processing and Optimization
    7.7   Indexing : Hash based indexing, Tree based indexing
    7.8   Distributed Database Systems and Object oriented database system
    7.9   Data Mining and Data Warehousing
    7.10 Database Security

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
    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: Concept and algorithms

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 Cyber 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 बमाजिम 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	