नेपाल चार्टर्ड एकाउन्टेन्ट्स संस्था

प्राविधिक सेवा, सूचना प्रविधि समूह, ०७ तह, वरीष्ठ अधिकृत पदको खुला र आन्तरिक प्रतियोगितात्मक परीक्षाको लागि पाठ्यक्रम

पाठ्यक्रम योजनालाई निम्नानुसारका दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :- लिखित परीक्षा पूर्णाङ्क :- २००

द्वितीय चरण :- अन्तर्वार्ता पूर्णाङ्क :- ३०

परीक्षा योजना (Examination Scheme)

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

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली		प्रश्नसंख्या × अङ्क	समय
प्रथम	सामान्य ज्ञान र बौद्धिक परीक्षण सेवा सम्बन्धी	१००	४०	वस्तुगत	बहुवैकल्पिक प्रश्न (MCQ)	१०० प्रश्न × १ अङ्क	१ घण्टा ३० मिनेट
द्वितीय	सेवा सम्बन्धी	१००	४०	विषयगत		१० प्रश्न × १० अङ्क	३ घण्टा

२. द्वितीय चरण : अन्तर्वार्ता (Interview)

बिषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तरवार्ता	३०	मौखिक

द्रष्टब्य :

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

२. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।

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

४. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नको 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 ।

५. वस्तुगत बहुवैकल्पिक हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षर (Capital Letter) A, B, C, D मा लेख्नुपर्नेछ । सानो अक्षर (Small Letter) a, b, c, d लेखेको वा अन्य कुनै सङ्केत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ ।

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

७. विषयगत प्रश्नको हकमा एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (short notes) सोध्न सकिने छ ।

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

९. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जुनसुकै कुरा लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम, विनियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भइै हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।

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

११. पाठ्यक्रम स्वीकृत मिति :- २०८०/०३/२५

नेपाल चार्टर्ड एकाउन्टेन्ट्स संस्था

प्राविधिक सेवा, सूचना प्रविधि समूह, ०७ तह, वरीष्ठ अधिकृत पदको खुला र आन्तरिक प्रतियोगितात्मक परीक्षाको लागि पाठ्यक्रम

प्रथम पत्र :

सामान्य ज्ञान, बौद्धिक परीक्षण तथा सेवा सम्बन्धी

खण्ड (क) :

सामान्य ज्ञान तथा बौद्धिक परीक्षण (५० × १ = ५० अङ्क)

1. General Awareness and Contemporary Issues (25 ×1 Mark = 25 Marks)

1.1 Physical, socio-cultural and economic geography and demography of Nepal

1.2 Major natural resources of Nepal

1.3 Geographical diversity, climatic conditions, and livelihood & lifestyle of people

1.4 Notable events and personalities, social, cultural and economic conditions in modern history of Nepal

1.5 Current periodical plan of Nepal

1.6 Information on sustainable development, environment, pollution, climate change, biodiversity, science and technology

1.7 Nepal's international affairs and general information on the UNO, SAARC & BIMSTEC

1.8 The Constitution of Nepal (From Part 1 to 5 and Schedules)

1.9 Governance system and Government (Federal, Provincial and Local)

1.10 Fundamentals of management: planning, organizing, directing, controlling, coordinating, decision making, motivation and leadership

1.11 Government planning, budgeting and accounting system

1.12 Major events and current affairs of national and international importance

2. General Ability Test (25 ×1 Mark = 25 Marks)

2.1 **Verbal Ability Test** (8×1 Mark = 8 Marks)
Jumble words, Series, Analogy, Classification, Coding-Decoding, Matrix, Ranking Order Test, Direction and Distance Sense Test, Common Sense Test, Logical Reasoning, Assertion and Reason, Statement and Conclusions

2.2 **Numerical Ability Test** (9×1 Mark = 9Marks)
Series, Analogy, Classification, Coding, Arithmetical reasoning/operation, Percentage, Ratio, Average, Loss & Profit, Time & Work, Data interpretation & Data verification

2.3 **Non-verbal/Abstract Ability Test** (8×1 Mark = 8 Marks)
Figure Series, Figure Analogy, Figure Classification, Figure Matrix, Pattern Completion/Finding, Analytical Reasoning Test, Figure Formation and Analysis, Rule Detection, Water images, Mirror images, Cubes and Dice &Venn-diagram

खण्ड (ख) :

सेवा सम्बन्धी (५० × १ = ५० अङ्क)

1. Digital Design and Computer Architecture (5 Marks)

1.1 Digital Design

1.1.1. Digital and Analog Systems

1.1.2. Number Systems

1.1.3. Logic Elements

1.1.4. Combinational Logic Circuits

1.1.5. Sequential Logic
1.1.6. Arithmetic Circuits
1.1.7. MSI Logic Circuits
1.1.8. Counters and Registers
1.1.9. IC logic families
1.1.10. Interfacing with Analog Devices
1.1.11. Memory Devices

1.2 Computer Architecture
- 1.2.1 Basic Structures: sequential circuits, design procedure, state table and state diagram, Von Neumann / Harvard architecture, RISC/CISC architecture
- 1.2.2 Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction cycle and excitation cycle
- 1.2.3 Processing Unit: instruction formats, arithmetic and logical instruction
- 1.2.4 Addressing modes
- 1.2.5 Input Output Organization: I/O programming, memory mapped I/O, basic interrupt system, Direct Memory Access (DMA)
- 1.2.6 Arithmetic Operations
- 1.2.7 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
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
6.8 Improvement, ISO standards, SEI-CMM, CASE tools

7. MIS 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. Theory of Computation, Data Structure and Algorithms (5 Marks)

8.1 Theory of Computation

- 8.1.1 DFA and NDFA, regular expressions, regular grammars
- 8.1.2 CFGs, Parsing and ambiguity, Pushdown automata, NPDAs & CFGs
- 8.1.3 Turing machines
- 8.1.4 Recursively enumerable languages Unrestricted grammars
- 8.1.5 The Chomsky hierarchy, Undecidable problems, Church's Thesis
- 8.1.6 Complexity Theory, P and NP

8.2 Data Structure and Algorithms

- 8.2.1 General concepts : Abstract data Type, Time and space analysis of algorithms, Big oh and theta notations, Average, best and worst case analysis
- 8.2.2 Linear data structures
- 8.2.3 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
- 8.2.4 Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
- 8.2.5 Hashing
- 8.2.6 Graphs and digraphs
- 8.2.7 Sorting

9. Artificial Intelligence and Advanced Topics in IT (5 Marks)

9.1 Artificial Intelligence

- 9.1.1 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
- 9.1.2 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.
- 9.1.3 Automated reasoning: FOPL; Knowledge Representation Languages. Basic Concepts of Natural Language Processing (NLP)
- 9.1.4 Game Playing

9.2 Advanced Topics in IT

- 9.2.1 Parallel and distributed computing
- 9.2.2 High speed networks
- 9.2.3 Software Architecture

9.2.4 Cryptography and network security
9.2.5 E-commerce
9.2.6 Software Project Management
9.2.7 Cloud Computing
9.2.8 Big Data Analytics
9.2.9 Internet of Things (IoT)
9.2.10 Machine Learning

10. Related Legislation and Institutions (5 Marks)

10.1 सूचना तथा सञ्चार प्रविधि नीति, २०७२
10.2 विद्युतीय कारोवार ऐन, २०६३
10.3 सार्वजनिक खरिद ऐन, २०६३ र सार्वजनिक खरिद नियमावली, २०६४
10.4 आर्थिक कार्यविधि तथा वित्तिय उत्तरदायित्व ऐन, २०७६ र आर्थिक कार्यविधि तथा वित्तिय उत्तरदायित्व नियमावली, २०७७
10.5 नेपाल चार्टर्ड एकाउन्टेन्ट्स ऐन, २०५३ र नियमावली
10.6 नेपाल चार्टर्ड एकाउन्टेन्ट्स संस्था कर्मचारी सेवा शर्त विनियमावली, २०६६
10.7 सूचना तथा सञ्चार प्रविधि संग सम्बन्धित प्रमुख निकायका भूमिकाहरु: सञ्चार तथा सूचना प्रविधि मन्त्रालय, सूचना प्रविधि विभाग, नेपाल दूरसञ्चार प्राधिकरण, राष्ट्रिय सूचना प्रविधि केन्द्र (सरकारी एकिकृत डाटा सेन्टर)

नेपाल चार्टर्ड एकाउन्टेन्ट्स संस्था

प्राविधिक सेवा, सूचना प्रविधि समूह, ०७ तह, वरीष्ठ अधिकृत पदको खुला र आन्तरिक प्रतियोगितात्मक परीक्षाको लागि पाठ्यक्रम

द्वितीय पत्र : सेवा सम्बन्धी

खण्ड (क) – (५० अङ्क)

1. Digital Design and Computer Architecture

1.1. Digital Design
- 1.1.1. Digital and Analog Systems
- 1.1.2. Number Systems
- 1.1.3. Logic Elements
- 1.1.4. Combinational Logic Circuits
- 1.1.5. Sequential Logic
- 1.1.6. Arithmetic Circuits
- 1.1.7. MSI Logic Circuits
- 1.1.8. Counters and Registers
- 1.1.9. IC logic families
- 1.1.10. Interfacing with Analog Devices
- 1.1.11. Memory Devices

1.2. Computer Architecture
- 1.2.1. Basic Structures : sequential circuits, design procedure, state table and state diagram, Von Neumann / Harvard architecture, RISC/CISC architecture
- 1.2.2. Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction cycle and excitation cycle
- 1.2.3. Processing Unit: instruction formats, arithmetic and logical instruction
- 1.2.4. Addressing modes
- 1.2.5. Input Output Organization : I/O programming , memory mapped I/O, basic interrupt system, Direct Memory Access (DMA)
- 1.2.6. Arithmetic Operations
- 1.2.7. Memory Systems

2. Operating System

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

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

3.4. and assembly, ICMP (Internet Control Message Protocol), routing on the internet, RIP (Routing Information Protocol), OSPF (Open Shortest Path First), router internals, IPv6
3.5. Transport Layer: principles, multiplexing and demultiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control
3.6. Application Layer : Web and Web caching, FTP (File Transfer Protocol), Electronic mail, DNS (Domain Name Service), socket programming

4. Structured and Object Oriented Programming

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

5.1. 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

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. Theory of Computation, Data Structure and Algorithms

7.1. Theory of Computation
- 7.1.1 DFA and NDFA, regular expressions, regular grammars
- 7.1.2 CFGs, Parsing and ambiguity, Pushdown automata, NPDAs & CFGs
- 7.1.3 Turing machines
- 7.1.4 Recursively enumerable languages Unrestricted grammars
- 7.1.5 The Chomsky hierarchy, Undecidable problems, Church's Thesis
- 7.1.6 Complexity Theory, P and NP

7.2. Data Structure and Algorithms
- 7.2.1 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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- 7.2.3 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
- 7.2.4 Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
- 7.2.5 Hashing
- 7.2.6 Graphs and digraphs
- 7.2.7 Sorting

8. MIS and Web Engineering

8.1. Information Systems and Decision Making; Knowledge Management.

8.2. Strategic use of Information Technology; Work Process Redesign (Reengineering) with Information Technology; Enterprise Resources Planning Systems

8.3. Information Systems Security, Information Privacy, and Global Information Technology issues

8.4. 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

8.5. 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

8.6. Client Side Scripting with JavaScript

8.7. Basics of AJAX; Introduction to XML and its application

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. 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