

**काठमाण्डौ महानगरपालिका**  
नेपाल इञ्जिनियरिङ्ग सेवा, अधिकृत छैटौं तह, कम्प्युटर इञ्जिनियर पदको खूला र आन्तरिक प्रतियोगितात्मक  
लिखित परीक्षाको पाठ्यक्रम  
एवं परीक्षा प्रणाली (योजना)

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

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

**१. प्रथम चरण: - लिखित परीक्षा योजना (Written Examination Scheme)**

पत्र	विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली	प्रश्नसंख्या X अङ्क	समय
प्रथम	कम्प्युटर इञ्जिनियरिङ्ग सम्बन्धी विषय	१००	४०	वस्तुगत: बहुवैकल्पिक प्रश्न (MCQ)	१०० प्रश्न X १ अङ्क	१ घण्टा १५ मिनेट
द्वितीय		१००	४०	विषयगत	७ प्रश्न X १० अङ्क	३ घण्टा
					Technical Writing १ प्रश्न X १० अङ्क	
Case Study १ प्रश्न X २० अङ्क						

**२. द्वितीय चरण: - अन्तर्वार्ता (Interview)**

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता (Interview)	३०	मौखिक (Oral)

**द्रष्टव्य :**

- यो पाठ्यक्रम रूपरेखालाई प्रथम चरण (लिखित परीक्षा) र द्वितीय चरण (अन्तर्वार्ता) गरी दुई चरणमा विभाजन गरिएको छ ।
- लिखित परीक्षाको माध्यम भाषा अंग्रेजी वा नेपाली अथवा अंग्रेजी र नेपाली दुवै हुन सक्नेछ ।
- प्रथम र द्वितीय पत्रको विषयवस्तु एउटै हुनेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- प्रथम तथा द्वितीय पत्रका एकाईहरूको प्रश्नसंख्या यथासम्भव निम्नानुसार हुनेछ ।

खण्ड	A					B					C					D		
प्रथम पत्रका एकाई	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17.1	17.2
प्रश्न संख्या	6	6	6	6	6	6	6	8	6	6	4	4	4	4	6	4	6	6
द्वितीय पत्रका एकाई	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Technical	Case
प्रश्न संख्या	2					3					2					Writing	Study	

- वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरूको 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 ।
- बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
- विषयगत प्रश्नका लागि तोकिएका १० अङ्कका प्रश्नहरूको हकमा १० अङ्कको 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 ।
- माथि तालिकामा उल्लेख भए अनुसार द्वितीय पत्रका १ देखि १६ सम्मका एकाईहरूबाट ७ (सात) प्रश्नहरू, Technical Writing को १० अङ्कको १ (एक) प्रश्न र Case Study को २० अङ्कको गरी जम्मा ९ (नौ) प्रश्नहरू सोधिने छन् ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
- प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
- पाठ्यक्रम लागू मिति :-

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लिखित परीक्षाको पाठ्यक्रम

प्रथम र द्वितीय पत्र :- कम्प्युटर इञ्जिनियरिङ्ग सम्बन्धी विषय

**Section (A)**

1. **Computer Networks**
  - 1.1 Protocol stack, switching
  - 1.2 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
  - 1.3 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)
  - 1.4 Transport Layer: principles, multiplexing and demultiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control
  - 1.5 Application Layer : Web and Web caching, FTP (File Transfer Protocol), Electronic mail, DNS (Domain Name Service), socket programming)
  - 1.6 Distributed system, Clusters
2. **Computer Architecture & Organization and Micro-processors**
  - 2.1 Basic Structures : sequential circuits, design procedure, state table and state diagram, von Neumann / Harvard architecture, RISC/CISC architecture
  - 2.2 Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction, cycle and excitation cycle.
  - 2.3 Processing Unit: instruction formats, arithmetic and logical instruction.
  - 2.4 addressing modes
  - 2.5 Input Output Organization : I/O programming , memory mapped I/O, basic interrupt system, DMA
  - 2.6 Arithmetic
  - 2.7 Memory Systems
  - 2.8 808X and Intel microprocessors: programming and interfacing
3. **Digital Design**
  - 3.1 Digital and Analog Systems. Number Systems.
  - 3.2 Logic Elements
  - 3.3 Combinational Logic Circuits
  - 3.4 Sequential Logic
  - 3.5 Arithmetic Circuits
  - 3.6 MSI Logic circuits
  - 3.7 Counters and Registers
  - 3.8 IC logic families
  - 3.9 Interfacing with Analog Devices
  - 3.10 Memory Devices
4. **Basic Electrical & Electronics**
  - 4.1 Electrical
    - 4.1.1 Basic Circuit Theory
    - 4.1.2 AC circuit Fundamentals
    - 4.1.3 Magnetic circuits and Transformers
    - 4.1.4 Transient Analysis, Filters
  - 4.2 Electronics
    - 4.2.1 Semiconductors, Diodes and Diode Circuits, Transistors,
    - 4.2.2 Transistor modeling

- 4.2.3 Biasing and Amplification
  - 4.2.4 Small Signal amplifiers and frequency response
  - 4.2.5 Large signal amplifiers, feedback amplifiers and Oscillators
  - 4.2.6 Operational amplifiers
5. **Principles of Electronic Communications**
- 5.1 Block Diagram of analog/ digital communication system
  - 5.2 Analog and Digital modulation techniques
  - 5.3 Fundamentals of Error Detection and Correction
  - 5.4 Performance evaluation of analog and digital communication systems: SNR and BER

**Section (B)**

6. **Structured and object oriented programming**
- 6.1 Data types, ADT
  - 6.2 Operators, variables and assignments, control structures
  - 6.3 Procedure/function
  - 6.4 Class definitions, encapsulation, inheritance, object composition, Polymorphism
  - 6.5 Pattern and framework
7. **Data structures**
- 7.1 General concepts : Abstract data Type, Time and space analysis of algorithms, Big oh and theta notations, Average, best and worst case analysis
  - 7.2 Linear data structures
  - 7.3 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
  - 7.4 Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
  - 7.5 Hashing
  - 7.6 Graphs and digraphs
  - 7.7 Sorting
8. **Software Engineering principles (System analysis & design)**
- 8.1 Software process: The software lifecycle models, risk-driven approaches
  - 8.2 Software Project management: Relationship to lifecycle, project planning, project control, project organization, risk management, cost models, configuration management, version control, quality assurance, metrics
  - 8.3 Software requirements: Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review.
  - 8.4 Software design: Design for reuse, design for change, design notations, design evaluation and validation
  - 8.5 Implementation: Programming standards and procedures, modularity, data abstraction, static analysis, unit testing, integration testing, regression testing, tools for testing, fault tolerance
  - 8.6 Maintenance: The maintenance problem, the nature of maintenance, planning for maintenance
  - 8.7 SE issues: Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI-CMM, CASE tools
9. **Database Management System**
- 9.1 Introduction : The relational model, ER model , SQL, Functional dependency and relational database design, File structure

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- 9.2 Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, Concurrency control techniques
- 9.3 Crash Recovery : types of failure, Recovery techniques
- 9.4 Query Processing and Optimization
- 9.5 Indexing : Hash based indexing, Tree based indexing
- 9.6 Distributed Database Systems and Object oriented database system
- 9.7 Data Mining and Data Warehousing
- 9.8 Security Management System
10. **Operating System**
  - 10.1 Processes and Threads: Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock.
  - 10.2 Scheduling
  - 10.3 Memory Management
  - 10.4 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.
  - 10.5 Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters.
  - 10.6 Security : Authentication and Access Authorization, System Flaws and Attacks, Trusted system
- Section (C)**
11. **Artificial Intelligence**
  - 11.1 Search
  - 11.2 Natural Language Processing
  - 11.3 Game Playing
  - 11.4 Learning
  - 11.5 Automated reasoning
  - 11.6 Planning
  - 11.7 Vision and Robotics
12. **Theory of Computation**
  - 12.1 BNF, Languages, grammars
  - 12.2 DFA and NDFA, regular expressions, regular grammars
  - 12.3 Closure, homomorphism
  - 12.4 Pigeonhole principle, pumping lemma
  - 12.5 CFGs, Parsing and ambiguity, Pushdown automata, NPDA's & CFGs
  - 12.6 Pumping lemma
  - 12.7 Turing machines
  - 12.8 Recursively enumerable languages Unrestricted grammars
  - 12.9 The Chomsky hierarchy, Undecidable problems, Church's Thesis
  - 12.10 Complexity Theory, P and NP
13. **Compiler design**
  - 13.1 The Structure of a Compiler
  - 13.2 Lexical Analyzer
  - 13.3 Top down Parsing/ Bottom up Parsing
  - 13.4 Syntax Directed Translation
  - 13.5 Types and Type Checking
  - 13.6 Run-Time Storage Administration
  - 13.7 Intermediate Code generation
  - 13.8 Data-Flow Analysis and Code Optimizations
  - 13.9 Architecture and recent development on compilers

14. **Computer Graphics**
  - 14.1 Graphics concepts
  - 14.2 Input devices and techniques
  - 14.3 Basic raster graphics algorithms and primitives
  - 14.4 Scan conversion
  - 14.5 Graphics hardware
  - 14.6 2D geometrical transformations and viewing
  - 14.7 3D geometry and viewing
  - 14.8 Hierarchical modeling
  - 14.9 Projections
  - 14.10 Hidden surface removal
  - 14.11 Shading and rendering
15. **Emerging Technology and Electives**
  - 15.1 Introduction to E-Commerce
  - 15.2 E-Commerce strategies
  - 15.3 E-Commerce Security issues
  - 15.4 Success model of E-Governance
  - 15.5 E-business b2b, b2c, c2c, g2g, g2c
  - 15.6 Principle of electronic payment, strategies and system
  - 15.7 E-marketing
  - 15.8 E-banking, EDI, SWIFT
  - 15.9 Encryption and Decryption methods, XML, Layout Managers
  - 15.10 Image processing
  - 15.11 Multimedia
  - 15.12 Expert system
  - 15.13 GIS/Remote sensing/GPS
16. **IT in Nepal**
  - 16.1 History of IT in Nepal
  - 16.2 IT policy 2067 BS
  - 16.3 Electronic Transaction Act and Regulation
  - 16.4 Nepali Unicode
  - 16.5 Licensing issues
  - 16.6 Copy write Act
  - 16.7 Local Self-Governance Act and Regulations

**Section (D)**

17. **Reasoning**
  - 17.1 Analytical and logical reasoning
  - 17.2 Quantitative Test

This section covers the examinee's reasoning aptitude as well as the presence of mind. Reasoning is to be done by reading a passage and answering the multiple choice question where as quantitative test is carried out by solving the mathematical problem (which needs no advanced level mathematical background)

The end