**Nepal Water Supply Corporation**

**Scheme of Examinations**

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<th>Paper</th>
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<th>Practical</th>
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<tr>
<td><strong>Practical</strong></td>
<td>Computer Hardware</td>
<td>100</td>
<td>20</td>
<td>100 X 1 = 100</td>
<td>Technical Writing</td>
<td>Case Study</td>
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<tr>
<td><strong>Written Exam</strong></td>
<td>Written Exam (Multiple Choice)</td>
<td>100 X 1 = 100</td>
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<td>100 X 1 = 100</td>
<td>100 X 1 = 100</td>
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**Notes:**

1. Written Exam will be in Nepali.
2. Written Exam will be in English.
3. Written Exam will consist of 20 multiple choice questions.
4. Written Exam will consist of 100 marks.
5. Written Exam will be in English.
6. Written Exam will be in Nepali.
7. Written Exam will be in English.
8. Written Exam will be in Nepali.
9. Written Exam will be in English.
10. Written Exam will be in Nepali.

**Questions:**

1. 100 marks
2. 100 marks
3. 100 marks
4. 100 marks
5. 100 marks
6. 100 marks
7. 100 marks
8. 100 marks
9. 100 marks
10. 100 marks

**Total:** 500 marks
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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. Structured and object oriented programming
   2.1 Data types, ADT
   2.2 Operators, variables and assignments, control structures
   2.3 Procedure/function
   2.4 Class definitions, encapsulation, inheritance, object composition, Polymorphism
   2.5 Pattern and framework

3. Artificial Intelligence
   3.1 Search
   3.2 Natural Language Processing
   3.3 Game Playing
   3.4 Learning
   3.5 Automated reasoning
   3.6 Planning
   3.7 Vision and Robotics

4. Data structures
   4.1 General concepts : Abstract data Type, Time and space analysis of algorithms, Big oh and theta notations, Average, best and worst case analysis
   4.2 Linear data structures
   4.3 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
   4.4 Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
   4.5 Hashing
   4.6 Graphs and digraphs
   4.7 Sorting

5. Computer Architecture and organization and micro-processors
5.1 Basic Structures: sequential circuits, design procedure, state table and state diagram, von Neumann / Harvard architecture, RISC/CISC architecture

5.2 Addressing Methods and Programs, representation of data, arithmetic operations, basic operational concepts, bus structures, instruction, cycle and excitation cycle.
5.3 Processing Unit: instruction formats, arithmetic and logical instruction.
5.4 Addressing modes
5.5 Input Output Organization: I/O programming, memory mapped I/O, basic interrupt system, DMA
5.6 Arithmetic
5.7 Memory Systems
5.8 808X and Intel microprocessors: programming and interfacing

6. Digital Design
6.1 Digital and Analog Systems, Number Systems.
6.2 Logic Elements
6.3 Combinational Logic Circuits
6.4 Sequential Logic
6.5 Arithmetic Circuits
6.6 MSI Logic circuits
6.7 Counters and Registers
6.8 IC logic families
6.9 Interfacing with Analog Devices
6.10 Memory Devices

7. Software Engineering principles (System analysis and design)
7.1 Software process: The software lifecycle models, risk-driven approaches
7.2 Software Project management: Relationship to lifecycle, project planning, project control, project organization, risk management, cost models, configuration management, version control, quality assurance, metrics
7.3 Software requirements: Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review.
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7.6 Maintenance: The maintenance problem, the nature of maintenance, planning for maintenance
7.7 SE issues: Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI-CMM, CASE tools

8. Database Management System
8.1 Introduction: The relational model, ER model, SQL, Functional dependency and relational database design, File structure
8.2 Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, Concurrency control techniques
8.3 Crash Recovery: types of failure, Recovery techniques
8.4 Query Processing and Optimization
8.5 Indexing: Hash based indexing, Tree based indexing
8.6 Distributed Database Systems and Object oriented database system
8.7 Data Mining and Data Warehousing
8.8 Security Management System
9. Operating System
9.1 Processes and Threads: Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock.
9.2 Scheduling
9.3 Memory Management
9.5 Distributed Systems: Distributed Message passing, RPC, Client/Server Computing, Clusters.

10. Theory of Computation
10.1 BNF, Languages, grammars
10.2 DFA and N DFA, regular expressions, regular grammars
10.3 Closure, homomorphism
10.4 Pigeonhole principle, pumping lemma
10.5 CFGs, Parsing and ambiguity, Pushdown automata, NPDA s & CFGs
10.6 Pumping lemma
10.7 Turing machines
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10.9 The Chomsky hierarchy, Undecidable problems, Church's Thesis
10.10 Complexity Theory, P and NP

11. Compiler design
11.1 The Structure of a Compiler
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   13.2.1 Semiconductors, Diodes and Diode Circuits, Transistors,
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14. Principles of Electronic Communications
   14.1 Block Diagram of analog/ digital communication system
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15. Emerging Technology and Electives
   15.1 Modeling and simulation
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   15.7 Distributed Object technology (ORB, DCOM)
   15.8 Speech signal processing
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   15.11 Software project management
   15.12 Embedded systems
   15.13 Image processing
   15.14 Multimedia
   15.15 Expert system
   15.16 GIS/ Remote sensing/ GPS

16. Reasoning
   16.1 Analytical and logical reasoning — √ 0
   16.2 Quantitative Test — F 0

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)
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