नेपाल नागरिक उड्डयन प्राधिकरण

प्राविधिक सेवा, सूचना प्रविधि (आई.टि.) समूह, सातौं तह, वरिष्ठ अधिकृत पदको खुला/आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

द्वितीय पत्र – सेवा सम्वन्धी

खण्ड (क) - ५० अङ्क

1. **Digital Design**
   - 1.1. Digital and Analog Systems
   - 1.2. Number System
   - 1.3. Logic Elements
   - 1.4. Combinational Logic Circuits
   - 1.5. Sequential Logic
   - 1.6. Arithmetic Circuits
   - 1.7. MSI Logic
   - 1.8. Counters and Registers
   - 1.9. IC logic families
   - 1.10. Interfacing with Analog Devices
   - 1.11. Memory Devices

2. **Computer Architecture 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. Microprogram sequencer, Addressing modes
   - 2.5. Input Output Organization: I/O programming, memory mapped I/O, basic interrupt system, DMA
   - 2.6. Memory Systems, Memory hierarchy, Memory mapping
   - 2.7. 808X and Intel microprocessors: programming and interfacing

3. **Basic Electrical and Electronics**
   - 3.1. Electrical
     - 3.1.1.Basic Circuit Theory
     - 3.1.2.AC circuit Fundamentals
     - 3.1.3.Transient Analysis, Filters
   - 3.2. Electronics
     - 3.2.1.Semiconductors, Diodes and Diode Circuits, Transistors
     - 3.2.2.Transistor modeling
     - 3.2.3.Biasing and Amplification
     - 3.2.4.Small Signal amplifiers and frequency response
     - 3.2.5.Large signal amplifiers and feedback amplifiers and Oscillators
     - 3.2.6.Operational amplifiers

4. **Principles of Electronic Communications**
   - 4.1. Block Diagram of analog/ digital communication system
   - 4.2. Analog and Digital Modulation Techniques
   - 4.3. Fundamentals of Error Detection and Correction
   - 4.4. Performance evaluation of analog and digital communication systems SNR and BER

5. **Computer Networks**
   - 5.1. Protocol stack, switching
   - 5.2. 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 switcher, Wireless LANs, PPP (Point to Point Protocol), Wide area protocols

5.3. 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, IRP (Routing Information Protocol) OSPF (Open Shortest Path First) router internals IPv6)

5.4. Transport Layer: Principles, Multiplexing and demultiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control

5.5. Application Layer: Web and web caching, FTP (File Transfer Protocol), Electronic Mail, DNS (Domain Name System), Socket programming

5.6. Distributed system, Clusters

6. **Operating System**

6.1. Processes and Threads: Symmetric Multiprocessing, Micro-kernels, Concurrency, Mutual Exclusion and Synchronization, Deadlock

6.2. Scheduling

6.3. Memory Management

6.4. 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

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

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

खण्ड (ख) - ५० अङ्क

7. **Software Engineering Principles (System analysis & design)**

7.1. Software Process: The software lifecycle models, risk-driven approaches

7.2. Software Project Management: Relationship to lifecycle, project organization, project planning, project cost models, procurement management, project implementation, project control, risk management, configuration management, version control, quality assurance metrics

7.3. Software Requirements: Requirements analysis, requirements solicitation, analyses tools, requirements definition, requirements specification, static and dynamic specifications, requirements review

7.4. Software Design: Design for reuse, design for change, design notations, design evaluation and validation.

7.5. Implementation: Programming standards and procedures, modularity, data abstraction, static analysis, unit testing, integration testing, regression testing, tools for testing, fault tolerance

7.6. Maintenance: The maintenance problem, the nature of maintenance, planning for maintenance

7.7. Software Engineering Issues: Formal methods, tools and environments for software engineering, software reengineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI-CMM, CASE tools

8. **Structured and Object-Oriented Programming**

8.1. Data types, ADT

8.2. Operators, variables and assignments, control structures

8.3. Procedure/ function

8.4. Class definitions, encapsulation, inheritance, object composition, polymorphism

8.5. Pattern and framework
8.6. Data structures
8.7. General concepts: Abstract data Type, Time and space analysis of algorithms, Big O and Theta notations, Average, Best and Worst case analysis
8.8. Linear data structures
8.9. Trees: General and binary trees, Representations and traversals, Binary search tree, balancing trees, AVL trees, 2-3 trees, red-black trees, self-adjusting trees, splay Trees
8.10. Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
8.11. Hashing
8.12. Graphs and digraphs
8.13. Sorting

9. **Database Management System**
9.1. Introduction: The relational model, ER model, SQL, Functional dependency and File structure
9.2. Normalization and Relational Database design
9.3. Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, Concurrency control techniques
9.4. Crash Recovery: Types of failure, Recovery techniques
9.5. Query Processing and Optimization
9.6. Indexing: Hash based indexing, Tree based indexing
9.7. Distributed Database Systems and Object-Oriented Database System
9.8. Data Mining and Data Warehousing
9.9. Security System Management

10. **Artificial Intelligence**
10.1. Search
10.2. Natural Language Processing
10.3. Game Playing
10.4. Learning and reasoning
10.5. Planning
10.6. Expert system
10.7. Vision and Robotics
10.8. Artificial Neutral Network and Computer Vision
10.9. Machine Learning

11. **Theory of Computation**
11.1. BNF, Language, Grammars
11.2. DFA and NDFA, regular expressions, regular grammars
11.3. Closure, homomorphism
11.4. Pigeonhole principle, pumping lemma
11.5. CFGs, Parsing and ambiguity, Pushdown Automata, NPDAs and CGFs
11.6. Pumping lemma
11.7. Turing machines
11.8. Recursively enumerable languages Unrestricted grammars
11.9. The Chomsky hierarchy, Undecidable problems, Church's Thesis
11.10. Complexity Theory, P and NP

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12. **Emerging Technology**
    - 12.1. Modeling and simulation
    - 12.2. Parallel and distributed computing
    - 12.3. High speed networks
    - 12.4. Adaptive web technology
    - 12.5. Speech signal processing
    - 12.6. Cryptography and network security
    - 12.7. Digital governance
    - 12.8. E-commerce
    - 12.9. Embedded systems
    - 12.10. Multimedia and Image processing
    - 12.11. GIS/Remote sensing/GPS
    - 12.12. Cloud Computing
    - 12.13. Big data analytics
    - 12.14. Blockchain technology

द्वितीय पत्रबाट निम्नानुसार प्रश्न सोधिने छ :

द्वितीय पत्र (विषयगत)				
विषय	**खण्ड**	**अङ्कभार**	**छोटो उत्तर**	**लामो उत्तर**
सेवा सम्वन्धी	**(क)**	५०	२ प्रश्न x ५ अङ्क = १०	४ प्रश्न x १० अङ्क = ४०
	(ख)	५०	२ प्रश्न x ५ अङ्क = १०	४ प्रश्न x १० अङ्क = ४०
जम्मा		**१००**	४ प्रश्न x ५ अङ्क = २०	८ प्रश्न x १० अङ्क = ८०