नेपाल नागरिक उड्डयन प्राधिकरण

प्राविधिक सेवा, सूचना प्रविधि (आई.टी.) समूह, नवौं तह, प्रबन्धक पदको खुला/आन्तरिक प्रतियोगितात्मक लिखित परीक्षाको लागि पाठ्यक्रम

द्वितीय पत्र : सेवा सम्बन्धी

खण्ड क - ५० अङ्क

1. **Computer Architecture**
   - 1.1 Architecture, programming and I/O, computer structure and typical processor architecture, processing unit and controller design, hardware and microprogram control
   - 1.2 CPU and memory organization, buses, characteristics of I/O and storage devices, Instruction sets and addressing modes, assembly language programming, I/O and interrupt servicing
   - 1.3 Multiple processor architectures, highly parallel machines, systolic arrays, neural networks, multitasking machines, real time systems, interconnection of multiple processor systems
   - 1.4 Architectures for specialized purposes, array processors, vector processors, and virtual machines
   - 1.5 Very large-scale integrated circuits
   - 1.6 Simplified design rules, static and dynamic logic, multiphase clocking, memory elements and memory structures, gate arrays and standard cell technology; placement and routing, programmable logic devices

2. **Data Communications and Computer Network**
   - 2.1 Data communications including signals, modulation and reception, Error detecting and correcting codes, Circuit and Packet Switching
   - 2.2 Multiplexing, including time, frequency and code division multiplexing
   - 2.3 Digital networks: ADSL, Wi-Fi, ISDN, frame relay, ATM, MPLS
   - 2.4 Protocols: ISO/OSI reference model, X.25
   - 2.5 Internetworking and router-based networks: TCP/IP suite of protocols, routing and flow control, Internet addressing ad domain names
   - 2.6 Local Area Networks, Topologies, Access Schemes, Medium Access and Logic
   - 2.7 Link Layer: services, error detection and correction, multiple access protocols, LAN addressing and Address Resolution Protocol (ARP), Ethernet, CSMA/CD multiple access protocol, hubs, bridges and switches, Wireless LANs, Point to Point Protocol (PPP), wide area protocols
   - 2.8 Network Layer: services, datagram and virtual circuits, routing principles and algorithms, Internet Protocol (IP), IP addressing, IP transport, fragmentation and assembly, Internet Control Message Protocol (ICMP), Routing on the Internet, Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Router Internals, IPv6
   - 2.9 Transport Layer: Principles, multiplexing and demultiplexing, UDP, TCP, flow control, principles of congestion control, TCP congestion control
   - 2.10 Application Layer: Web and Web caching, File Transfer Protocol (FTP), Electronic mail, Domain Name Service (DNS), Socket Programming
   - 2.11 Distributed System Clusters

3. **Cryptography and Network Security**
   - 3.1. Introduction to Cryptography: Security Attacks, Conventional Encryption Model, Simplified DES, Block Cypher Principle
   - 3.2. Principles of Public Key, Crypto Systems: RSA algorithm, Diffie-Hellman Key exchange, Number Theory – Prime and Relatively Prime Numbers
   - 3.3. Message Authentication and Hash Function

3.4. Digital Signature and authentication Protocols: Digital Signatures, Digital Signature Standards, Authentication protocols
3.5. Network Security: Authentication Applications – Kerberos, Electronic Mail Security
3.6. Web Security: Web Security Requirements, Secure Sockets Layers and Transport Layer Security, Secure Electronic Transaction
3.7. Intruders and Viruses Related Threats
3.8. Firewall Design Principles
3.9. Introduction to Trusted Systems

4. **Client Server Computing**
4.1. Client server computing concepts: Building blocks, the state of client server infrastructure
4.2. SQL database services: fundamentals of database servers, functions, procedures, triggers and rules
4.3. SQL middleware basics: SQL API, Open SQL Gateway
4.4. Concept of Data Warehouses and Data Mining
4.5. Client Server Transaction Processing: Transaction Concepts, Transaction Models, Transaction Processing Monitors, Transaction Management Standards

5. **Distributed Systems**
5.1. Characteristics of distributed systems, Fundamental concepts and mechanisms
5.2. Networked vs. centralized systems
5.3. Client Server Systems
5.4. Process synchronization and inter process communications
5.5. Principles of fault tolerance
5.6. Transaction processing techniques
5.7. Distributed file systems
5.8. Operating systems for distributed architectures

6. **Operating Systems**
6.1. Operating system principles, components and usage; Design and implementation of operating systems
6.2. Synchronization of concurrent processes, resource allocation, deadlock, scheduling, memory management, protection and privacy; Data, task and job management: loading, linking I/O control
6.3. Multitasking and multiprocessing real time aspects
6.4. Basic characteristics of modern operating systems: Unix, Linux, Windows

7. **Management Information Systems**
7.1. Organizations and Information Systems
7.2. How information system impact organizations and business firms
7.3. The impact of IT on management decision making
7.4. Organization and Information: Classification and value, Information requirements
7.5. Development and Implementation of MIS
7.6. Management of quality in MIS
7.7. Decision support systems
7.8. IT Management

8. **Software Project Management**
8.1. Investment analysis: Open-source software Vs Proprietary software, Packaged Software Vs In-house Software Development Vs outsourcing

8.2. Feasibility study: breakeven analysis, Time value of money, financial analysis
8.3. Software cost estimation: cost models
8.4. Project planning, project control, project organization, Team building approach
8.5. PERT/CPM network
8.6. Relationship to software development lifecycle (SDLC), Requirement engineering, Risk management, configuration management, version control, quality assurance, Software integration, Verification and validation, Business process reengineering.

खण्ड ख - ५० अङ्क

9. **Software Engineering**
   9.1. Software process: Software Process models, risk-driven approaches
   9.2. Software requirements: Requirements analysis, requirements solicitation, analysis tools, requirements definition, requirements specification, static and dynamic specifications, requirements review.
   9.3. Software design: Design for reuse, design for change, design notations, design evaluation and validation, Software Architecture, Context diagram and DFD, Object Modeling: Object-Oriented Concept, Object Structure, Object Feature, Class and Object, Use Case Diagram, Class Diagram, State Diagram, Event Flow Diagram
   9.4. Implementation: Programming standards and procedures, modularity, data abstraction, static analysis, verification and validation, unit testing, integration testing, regression testing, tools for testing, quality assurance and fault tolerance.
   9.5. Maintenance: The maintenance problem, the nature of maintenance, planning for maintenance, software maintenance, configuration management and source code management
   9.6. SE issues: Formal methods, tools and environments for software engineering, role of programming paradigm, process maturity and Improvement, ISO standards, SEI-CMM, CASE tools

10. **Structured and object-oriented programming**
   10.1. Data types, ADT
   10.2. Operators, variables and assignments, control structures, Procedure/function
   10.3. Class definitions, encapsulation, inheritance, object composition, Polymorphism
   10.4. Pattern and framework
   10.5. Programming with C, C++, Java

11. **Data Structures and Algorithm**
   11.1. General concepts: Abstract data type, Time and space analysis of algorithms, Bio Oh and theta notations, average, best, and worst-case analysis
   11.2. Linear data structures
   11.3. 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
   11.4. Algorithm design techniques: Greedy methods, Priority queue search, Exhaustive search, Divide and conquer, Dynamic programming, Recursion
   11.5. Sorting

12. **Databases and File Systems**
   12.1. Data models, data normalization, data description languages, query facilities, data integrity and reliability, concurrency
   12.2. Databases: hierarchical, network and relational databases; data organization
   12.3. Relational query languages: relational algebra and calculus, SQL

12.4. Normalization and Relational database design
12.5. Transaction processing, query processing, reports, security and integrity
12.6. File organization: sequential, indexed and direct access, multiple key and hashing
12.7. File processing: records, files, compaction, Sorting, merging and updating files
12.8. Algorithms for inverted lists, multi list, indexed sequential and hierarchical structures; File I/O: control, utility, space allocation and cataloguing, index organization

13. **Database Management System**
13.1. Introduction: Relational model, ER model, SQL, functional dependency and relational database design, file structure
13.2. Transaction Management and Concurrency Control: Concurrent execution of the user programs, transactions, concurrency control techniques
13.3. Crash Recovery: types of failure, recovery techniques
13.4. Query processing and optimization
13.5. Indexing: Hash based indexing; Tree based indexing
13.6. Distributed database systems and Object-oriented database system
13.7. Data mining and data warehousing
13.8. Data Security

14. **Internet Programming**
14.1. Common Gateway Interface (CGI) application, input to CGI: environmental variables, accessing from input, output from CGI: CGI and response headers, Forms and CGI: Sending data to the server using HTML tags and Executing External Program and Executing external program ad CGI program
14.2. Hypermedia Documents: Creating dynamic pages using CGI, PHP

15. **Recent Trends**
15.1. E-commerce and its application, models, technology behind E-commerce
15.2. Digital governance: Introduction, Models, Services, Managing public data, E-government, E-government strategy and emerging issues
15.3. E-payment and E-transaction: Electronic payment systems, ATM, Point of Sales, Security issues in electronic transactions
15.4. GIS and remote sensing
15.5. Advanced data storage techniques: Enterprise data storage, clustering, network attached storage (NAS), storage area networks (SAN)
15.6. Cloud Computing
15.7. Big data analytics
15.8. Blockchain technology

द्वितीय पत्रबाट निम्नानुसार प्रश्न सोधिनेछ :

द्वितीय पत्र (विषयगत)				
विषय	**खण्ड**	**अङ्कभार**	**तर्कयुक्त विश्लेषणात्मक प्रश्न**	**समस्या समाधानमूलक प्रश्न**
सेवा सम्वन्धी	**(क)**	५०	३ प्रश्न X १० अङ्क = ३०	१ प्रश्न X २० अङ्क = २०
	(ख)	५०	३ प्रश्न X १० अङ्क = ३०	१ प्रश्न X २० अङ्क = २०
जम्मा		**१००**	६ प्रश्न X १० अङ्क = ६०	२ प्रश्न X २० अङ्क = ४०