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**1. Theory of Computation:**

- 1.1 Regular Languages and Finite Automata
- 1.2 Context Free Languages and Push-down Automata
- 1.3 Recursively Enumerable Sets and Turing Machines
- 1.4 Undecidability, Completeness

**2. Digital Logic :**

- 2.1 Number System, Logic gates, Boolean algebra, Logic functions, Minimization
- 2.2 Design and Synthesis of Combinational & Sequential Circuits
- 2.3 Number Representation and Computer Arithmetic (fixed and floating point), K-Maps, De-Morgan's Theorem
- 2.4 Flip Flops, Counters, Registers, Decoders, Multiplexers, Address, Digital Integrated Circuits

**3. Computer Organization and Architecture:**

- 3.1 Basic Computer Organization and Design
- 3.2 Machine Instructions and Addressing Modes, ALU and Data Path, CPU Control Design, Memory interface, I/O interface, Instruction Pipelining
- 3.3 Cache Memory and Mapping Techniques, Main Memory, Secondary Storage, and Microprocessor

**4. Procedural Programming:**

- 4.1 Procedures and Modularity
- 4.2 Control Statements, Looping, Array, Pointers, Structure and Union, File Handling, Functions, Recursion, Parameter passing, Scope, Binding

**5. Object Oriented Programming Language:**

- 5.1 Object and Classes, Method, Inheritance, Polymorphism
- 5.2 Modularity, Encapsulation, Abstraction, Operator Overloading, Virtual Function

**6. Data Structures and Algorithms:**

- 6.1 Abstract Data Types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary Search Trees, Binary Heaps

6.2 Analysis, Asymptotic Notation, Notions of Space and Time Complexity, Worst and Average Case Analysis

6.3 Design: Greedy Approach, Dynamic Programming, Divide-and-Conquer

6.4 Tree and Graph Traversals, Connected Components, Spanning Trees, Shortest Paths; Hashing, Sorting, Searching

## **7. Databases**

7.1 ER-model, Relational model (Relational Algebra, Tuple Calculus)

7.2 Database Design (Integrity Constraints, Normal Forms)

7.3 Query Languages (SQL), File Structures, Transactions and Concurrency Control, Normalization Concepts, Client/Server Architecture

## **8. System Analysis and Design:**

8.1 Requirement Analysis, System Design

8.2 Entity Relationship Diagram, Data Flow Diagram, Software Development Life Cycles, MIS

8.3 Decision Support System, Software Engineering and User-Interface Design Considerations.

## **9. Computer Networks and Network Security :**

9.1 ISO/OSI Model

9.2 LAN technologies (Ethernet, Token Ring)

9.3 Flow and Error Control Techniques

9.4 Routing Algorithms, Congestion Control

9.5 TCP/IP, UDP, Sockets

9.6 IP (v4), IP (v6),

9.7 Application Layer Protocols (ICMP, DNS, SMTP, POP, FTP, http)

9.8 Basic concepts of Hubs, Switches, Gateways, and Routers

9.9 Internetworking, E-mail, Internet and Intranet, Extranet

9.10 Encryption, Decryption, Asymmetric / Symmetric Algorithms, RSA Algorithm, Firewalls, Proxies, Intrusion Detection and Protection System, Security-Confidentiality, Integrity and Authentication, IPSec (VPN), PKI, TCP/IP, LAN, WAN, VLANs

## **10. Operating System:**

10.1 Resources and Sharing

10.2 Resource Management and Spooling

10.3 Single Task, Multi Tasking and Multi User, Multiprocessing, Batch Processing,

10.4 Processes and Threads, Process Scheduling

10.5 Inter-process Communication, Concurrency, Synchronization, Deadlock, CPU Scheduling, Memory Management and Virtual Memory, Disk and File systems, I/O systems, Protection and Security, Embedded systems,

10.6 Open Source, Microsoft Windows, Kernel, Real time OS

**सैनिक सेवाको कम्प्युटर विधि प्राविधिक अधिकृत**  
**प्रयोगात्मक परीक्षाको पाठ्यक्रम**

१. पाठ्यक्रमको उद्देश्य:

- आवश्यकता अनुसार Database Design गरि समय अनुसार परिमार्जन गर्न सक्ने] । RDBMS को Architecture बारे विग भई Oracle, SQL Server वा सो सरह RDBMS राम्रोसंग सन्चालन गर्न सक्ने हुनु पर्ने ।
- C, C++ ,Java Programming Language वा सो सरह अन्य High Level Language प्रयोग गरी Program लेख्न र उक्त प्रोग्राम प्रयोग गरि Output निकाल्न सक्ने ।
- Network सम्बन्धि Basic Concept भएको, Network Security, Trouble Shooting गर्न तथा Network Support Tool प्रयोग गरि काम गर्न सक्ने ।
- Web Programming जस्तै php, asp, asp.net वा सो सरह अन्य Program हरु प्रयोग गरी Website तयार पार्न सक्ने हुनु पर्ने ।
- Data Structure / Algorithms बारे राम्रो विग हुनु पर्ने ।
- कुनै पनि System Analysis गरि Design समेत गर्न सक्ने ।

- २= समय M ७० मिनेट
- ३= प्रश्नसंख्या M ७ जे (सवै अनिवार्य)
- ४= पूर्णाङ्क M ५०
- ५= उत्तीर्णाङ्क M २५
- ६= प्रश्नको निर्माण, प्रश्न भार र समयको वितरण :-

S.N	Topics	Marks Distribution	Time (Minutes)
1	Database Design	10	60
2	Database Recovery & Backup	5	
3	Database Security & Integrity	5	
4	Database Based Programming	10	
5	Programming Concepts	10	
6	Networking Viva	5	10
7	Network & Hardware Equipment Identification	5	
	<b>Total</b>	<b>50</b>	<b>70</b>

७. **Database Design** को लागि एउटा Flat Table दिईनेछ ।

- उक्त Flat Table लाई Normalization गरि आवश्यकता अनुसार Table Generate गरेको खण्डमा अंक २ प्रदान गरिनेछ ।
- Table Generate गरेर सहि ER Model अथवा Data Flow Diagram बनाएको खण्डमा अंक ५ प्रदान गरिनेछ ।
- पांच वटा SQL Query लेख्न दिईनेछ । प्रत्येक सहि SQL Query वापत अंक १ प्रदान गरिनेछ ।
- माथि उल्लेखित सबै कार्य सहि भएको खण्डमा अंक १० प्रदान गरिनेछ ।

८. **Database Recovery and Backup**

- Transaction Execution & Concurrency Control Mechanism को लागि अंक २ प्रदान गरिनेछ ।
- Deferred Update & Immediate Update को लागि अंक २ प्रदान गरिनेछ ।
- ACID Properties को लागि अंक १ प्रदान गरिनेछ ।

९. **Database Security and Integrity**

- Discretionary Security Mechanism को लागि अंक १ प्रदान गरिनेछ ।
- Mandatory Security Mechanism को लागि अंक १ प्रदान गरिनेछ ।
- Integrity Constraints को लागि अंक १ प्रदान गरिनेछ ।

१०. **Database Based Programming:** Database Design मा तयार भएको Table लाई उपयुक्त Programming Language प्रयोग गरि Database Based Program तयार गरेमा अंक १० प्रदान गरिनेछ ।

- उक्त Program मा Database बाट Data हरुलाई Form मा Load गर्न सकेको खण्डमा अंक २.५ प्रदान गरिनेछ ।
- Database मा Data हरु Form बाट Add गर्न सकेको खण्डमा अंक २.५ प्रदान गरिनेछ ।
- Database मा Data हरु Form बाट Update गर्न सकेको खण्डमा अंक २.५ प्रदान गरिनेछ ।
- Database मा Data हरु Form बाट Delete गर्न सकेको खण्डमा अंक २.५ प्रदान गरिनेछ ।

