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BCA Honours | Semester IV | BCA4FV108

Introduction to Cyber Laws

Module 2 Comprehensive Notes

Module 2: The Information Technology Act, 2000 (Statutory Framework)

Enacted by the Indian Parliament and notified on October 17, 2000 (and substantially amended by the IT Amendment Act, 2008), the Information Technology Act, 2000 (IT Act) serves as the primary legislation governing electronic commerce, electronic governance, and cyber offenses in India.

2.1 Objectives and Scope of the IT Act

- To grant formal legal recognition to transactions carried out by means of electronic data interchange (EDI) and other means of electronic communication.
- To facilitate the electronic filing of documents with government agencies and municipal authorities (Electronic Governance).
- To amend the Indian Penal Code (1860), the Indian Evidence Act (1872), the Bankers' Books Evidence Act (1891), and the Reserve Bank of India Act (1934) to accommodate digital evidence.
- **Extraterritorial Jurisdiction (Section 75):** The Act applies to any offense or contravention committed outside India by any person, irrespective of their nationality, if the act involves a computer, computer system, or computer network located in India.

2.2 Key Statutory Definitions (Section 2)

Defined Term	Statutory Definition and Legal Scope
Computer (Sec 2(1)(i))	Any electronic, magnetic, optical or other high-speed data processing device or system which performs logical, arithmetic, and memory functions by manipulations of electronic, magnetic or optical impulses. Encompasses smartphones, tablets, ATMs, and IoT appliances.
Electronic Record (Sec 2(1)(t))	Data, record or data generated, image or sound stored, received or sent in an electronic form or micro film or computer generated micro fiche.
Digital Signature (Sec 2(1)(p))	Authentication of any electronic record by a subscriber by means of an electronic method or procedure in accordance with the provisions of Section 3 (asymmetric crypto-system and hash functions).
Intermediary (Sec 2(1)(w))	Any person who on behalf of another person receives, stores or transmits that record or provides any service with respect to that record. Includes telecom service providers, ISPs, web hosting services, search engines, payment gateways, e-commerce platforms, and social media networks.

2.3 Electronic Governance and Attribution of Records

- **Legal Recognition of Electronic Records (Section 4):** Where any law provides that information shall be in writing or in typewritten or printed form, then, notwithstanding anything contained in such law, such requirement shall be deemed to have been satisfied if such information is rendered in an electronic form and accessible for subsequent reference.

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- **Attribution, Acknowledgment, and Dispatch (Sections 11–13):** An electronic record is attributed to the originator if it was sent by the originator personally or by an automated program. Dispatch occurs when a message enters a resource outside the originator's control; receipt occurs when it enters the designated electronic address of the addressee.

2.4 Regulation of Certifying Authorities and PKI

The Act creates a tiered Public Key Infrastructure (PKI) hierarchy under the **Controller of Certifying Authorities (CCA)**:

- The CCA licenses, supervises, and audits licensed Certifying Authorities (CAs).
- CAs issue Digital Signature Certificates (DSC) to subscribers after verifying subscriber identity.
- Subscribers generate public-private key pairs, maintaining strict personal control over their private keys to prevent unauthorized cryptographic signing.

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1. Architectural Trade-offs and Computational Complexity

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- **Time Complexity Optimization versus Spatial Footprint:** In high-throughput algorithmic pipelines handling Module 2 Core Concepts and Methods, pre-computing intermediate lookup tables, spatial indices, and hashing structures achieves near-instantaneous $O(1)$ query latency, but inflates the physical memory footprint. Conversely, in-place algorithms minimize RAM utilization at the cost of higher CPU cycle counts. Modern architectures dynamically calibrate memory allocations using memory-mapped files and cache-aware structures.
- **Concurrency Scalability versus Thread Contention:** While multi-core hardware allows horizontal execution, concurrent modifications to shared state structures create severe lock contention, thread synchronization bottlenecks, and cache line invalidation storms. High-performance frameworks deploy lock-free algorithms, optimistic concurrency control, and atomic compare-and-swap (CAS) primitives.
- **Algorithmic Determinism versus Heuristic Scalability:** Exact mathematical algorithms frequently encounter NP-hard combinatorial barriers as problem dimensions scale. Contemporary systems bridge this gap by deploying bounded approximation algorithms and meta-heuristics that produce near-optimal solutions within guaranteed execution time windows.

2. Empirical Comparative Framework

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Resilience & Failover	Manual failover mechanisms requiring operator intervention and scheduled downtime.	Automated self-healing clusters with dynamic health checking and zero-downtime rolling deployments.	Continuous availability meeting strict 99.999% Service Level Agreements (SLAs).
System Telemetry & Auditing	Passive log file aggregation with retrospective forensic analysis.	Distributed tracing, structured metrics collection, and real-time observability telemetry.	Proactive bottleneck resolution and sub-second mean time to detection (MTTD).

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