Unit IV — Blockchain, 3D Printing, Disruptive Tech & Immersive Reality

Emerging Technologies for Business | BMB IT 02

Unit IV: Blockchain, 3D Printing, Other Disruptive Technologies and AR/VR/MR

Syllabus: Blockchain fundamentals — distributed ledgers, smart contracts, business applications (finance, supply chain, traceability); real-world challenges and regulatory considerations. 3D Printing (Additive Manufacturing) — technology, business use cases, supply chain impact, mass customization. Survey of additional emerging technologies (neuromorphic computing, quantum computing, edge computing). AR, VR, MR and Virtual Try-On in business — differences, technologies, immersive experiences in marketing, training, product design and simulation; Virtual Try-On concepts and applications; data-driven personalization; challenges and opportunities.

Exam Blueprint (2025-26 paper)

YE QUESTION BAAR-BAAR AAYA HAI

Ye **is subject ka sabse bada unit** hai (12 hours) aur 2025-26 me isse **paanch Section C questions** aaye — blockchain types, smart contracts, 3D printing principles, neuromorphic computing, aur VR/AR/MR ka farak. **Section C ka lagbhag poora hissa isi unit se tha.**

Topic	2025-26 paper	Marks
Blockchain + types of blockchain	Section C	7
Smart contracts	Section C	7
3D printing — principles and uses	Section C	7
Neuromorphic computing + advantages	Section C	7
VR vs AR vs MR	Section C	7

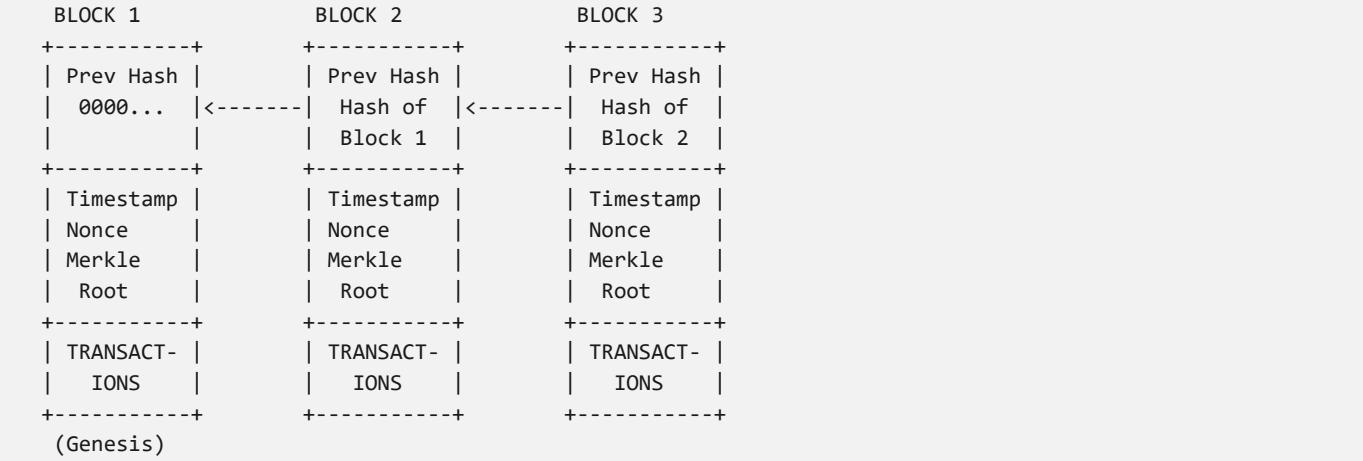
PART A — BLOCKCHAIN

1. Blockchain Fundamentals

DEFINITION - RATTA MAARO

Blockchain is a **distributed, decentralised, immutable digital ledger** in which transactions are recorded in **blocks** that are cryptographically linked in **chronological order**, maintained across a **peer-to-peer network** of computers, where no single party has control and records once written **cannot be altered**.

1.1 Structure of a Block




```
Har block me pichle block ka hash hai -> ek block badlo toh
aage ke saare hashes toot jaate hain -> tampering turant pakdi jaati hai
```

Each block contains: the **hash of the previous block** (this is what forms the chain), a **timestamp**, the **transaction data**, a **Merkle root** (a single hash summarising all transactions), and a **nonce** (the number miners vary to solve the puzzle).

1.2 Key Characteristics

Characteristic	Meaning
Decentralised	No single central authority; the ledger is held by all participants
Distributed	Every node holds a copy; there is no single point of failure
Immutable	Once written and confirmed, a record cannot be changed or deleted
Transparent	All participants can see the same records (in public chains)
Secure	Protected by cryptography and hashing
Consensus-driven	Participants must agree before a block is added
Chronological / append-only	New data is only added; nothing is overwritten

1.3 How Blockchain Works — the six steps

1. A user **requests a transaction**
2. The request is **broadcast to the peer-to-peer network** of nodes
3. Nodes **validate** the transaction using consensus algorithms
4. Verified transactions are **combined into a block**
5. The block is **added to the existing chain**, secured by the hash of the previous block
6. The transaction is **complete and permanent**; every node updates its copy

1.4 Consensus Mechanisms

> **DEFINITION - RATTA MAARO**
>
> A **consensus mechanism** is the method by which a distributed network **agrees** on which transactions are valid and in what order, without trusting any single party.