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BlockChain Assignment 1

① BlockChain Bacis

- Define BlockChain

→ A blockchain is a decentralized digital ledger that stores data in blocks linked chronologically and cryptographically. Each block contains a hash of the previous block, timestamp, data, and a nonce. This structure ensures tamper-resistance, as altering one block would require changing all subsequent blocks, which is computationally difficult. Blockchain are maintained by distributed networks, where consensus mechanisms like proof of work or proof of stake ensure data validity without a central authority.

- List two real life cases.

→ (i) Supply chain management:-
Blockchain helps track product movement from origin to consumer, ensuring transperency and reducing fraud.

(ii) Digital identity:-
Individuals can control their identities securely using blockchain, avoiding centralized breaches.

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(2) Block Anatomy :-

- Draw block Anatomy ~~Dia~~ Daigram.

→

Block #1
Timestamp : 2025-06-07
Data : "Transaction A"
Previous Hash : 0000
Nonce : 57348
Merkle Root : a1b2c3d4
Hash : 4f7c...ef9

- Briefly explain with an example how the Merkle root helps verify data integrity.

→ The Merkle root is a single hash representing all transaction in a block. Transaction are hashed and paired recursively until one root hash remains.

Example:
If you have transactions Tx1 and Tx2, their hashes H1 and H2 Combine into Merkle Root = Hash (H1 + H2). If any transaction changes, the root changes, helping verify data integrity quickly without scanning the whole block.

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(3) Consensus Conceptualization

- What is Proof of work and why does it require energy?

→ PoW requires nodes (miners) to solve Complex math Problems to validate blocks. It's energy-intensive because miners perform millions of hash operations to find a valid nonce that meets the difficulty target.

- What is proof of Stake and how does it diffe

→ POS Selects validators based on the amount of CryptoCurrency they "Stake" in the network. More Stake = higher Chance to validate. It's energy-efficient and discourge bad behaviour since validators risk their Stake.

- What is Delegeted proof of Stake and how are validators Selected?

→ In ~~DoPs~~ DPos, Stakeholders vote for a small number of trusted delegates who validate transaction. It improves Scalability and performance. Validator are selected through Community voting, making the System more democratic and fast.