SNS COLLEGE OF ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

IOT Including CS&BCT

COURSE NAME : DISTRIBUTED LEDGER TECHNOLOGY

TOPIC : Block in a Block chain-find Transactions-Distributed Consensus-Proof of work,

Block in a Blockchain

- A block is a digital record in a blockchain containing transaction data.
- Each block is linked to the previous one, forming a chain.

Components of a Block:

Block Header:

- Hash of the previous block (ensures immutability).
- Timestamp (records when the block was created).
- Nonce (used in mining for proof of work).

Transaction Data:

- List of validated transactions.

Merkle Tree Root:

- A structure that summarizes all transactions efficiently.

How Blocks are Added?

Miners validate and add blocks using cryptographic algorithms.

Finding Transactions & Distributed Consensus

Finding Transactions in a Blockchain

Transactions are stored in blocks and linked via hashes.

Search methods:

Using Block Explorers (Etherscan, Blockchain.com).

Querying via Wallets or Nodes.

Distributed Consensus

- Ensures all network participants agree on the blockchain's state.

Methods:

- Proof of Work (PoW) – Used in Bitcoin.
- Proof of Stake (PoS) – Used in Ethereum 2.0.

Proof of Work (PoW)

What is Proof of Work?

Proof of Work is a consensus algorithm used in blockchain networks like Bitcoin. It requires miners to solve complex mathematical problems to add new blocks to the chain.

Steps in Proof of Work:

Transaction Verification: Nodes validate transactions and collect them into a block.
Hash Computation: Miners compete to solve a cryptographic puzzle.
Block Addition: The first miner to find the correct hash adds the block to the chain.
Network Confirmation: Other nodes verify and accept the block.

Advantages of PoW:

High security against attacks.
Fully decentralized transaction validation.

Disadvantages of PoW:

Energy-intensive due to high computational power.
Slower transaction processing compared to other consensus mechanisms.