Mini Task 1 : Theoretical Part

1. Blockchain Basics :-

- Define blockchain in your own words

→ A blockchain is a digital ledger that records information in a secure, transparent and decentralized way. It consists of blocks that store data, and each block is linked to the previous one using hashes, making a continous chain. Once data is recorded in a block it cannot be changed without altering all subsequent blocks. The data is chronologically consistent because you cannot delete or modify it

- List 2 real life use cases

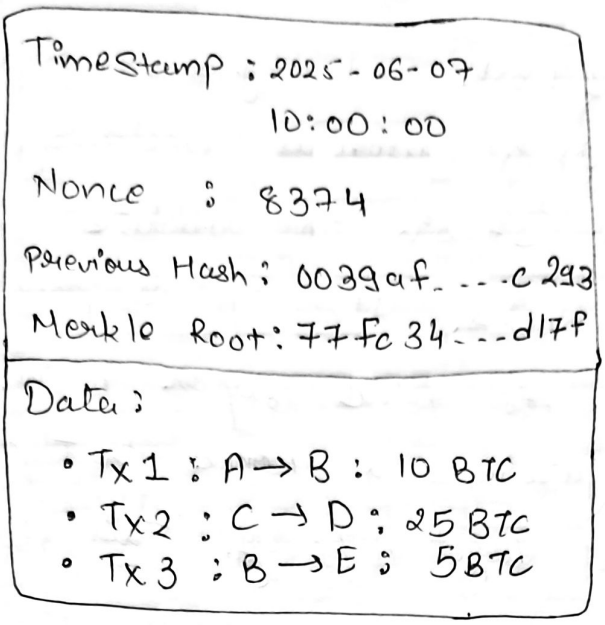
→ Healthcare : The most important application of blockchain in healthcare is Electronic Medical Record (EMR), which is the certificate to store and use the personal medical data.

→ Food Traceability :-

→ Food Traceability is the use of data collection technology to collect the data produced in food production, inspection, supervision in each link, and then store the data to form a food supply chain database system.

2. Block Anatomy

- Draw a block showing : data, previous hash, nonce, time stamp and Merkle Root



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

→ The Merkle root helps verify data integrity by summarizing all transaction in a block using a single hash value. This hash is built through a Merkle tree, where each leaf node is a transaction hash, and parents nodes are hashes of child nodes, continuing until one final hash is formed.

Example :

Suppose a block has 4 transactions :- Tx1, Tx2, Tx3, Tx4
Each is hashed. H1, H2, H3, H4

Then :

Combine H1 + H2 → Hash again → H12

Combine H3 + H4 → Hash again → H34

Combine H12 + H34 → Final hash → Merkle Root

3. Consensus Conceptualization:-

- Explain in brief (4-5 sentences Each)

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

→ Proof of Work is a Consensus mechanism used in blockchain like Bitcoin to validate transactions and add new blocks. It requires participants, called miners, to solve Complex mathematical puzzles by guessing a nonce that produces a hash below a target difficulty. This process consumes a large amount of Computational power and energy because it involves trying millions of Combinations. The high energy use come from the Competition among miners and the intense Computing effort required.

- What is Proof of Stake and how does it differ?

→ Proof of Stake (PoS) is a blockchain Consensus method where validators are chosen based on how much cryptoCurrency they lock as a Stake Unlike Proof of Work, it doesn't require solving Complex puzzles, making it more energy-efficient. Validators with higher Stakes have a better Chance of being selected to Create new blocks. PoS rewards participants based on ownership, not Computing power

- What is Delegated Proof of stake and how are validators selected?

→ DPOS is a consensus model where token holders vote to elect a few trusted validators to manage the blockchain. Voting power depends on the amount of tokens held and can be changed anytime. DPOS allows faster transactions, better scalability, and adds community driven governance to hold validators accountable.