HOME ASSIGNMENT-3.

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1) Types of blockchain with examples:

i) Public Blockchain:

Fully decentralized, open to anyone for participation in reading, writing and verifying transactions.

Example: Bitcoin, Ethereum.

ii) Private Blockchain:

centralized and restricted, only specific participants will read and write data.

Ex: Hyperledger Fabric, Coara.

iii) Consortium blockchain: Semi-decentralized, managed by a group of organizations rather than a single entity.

Ex: Energyweb foundation, Quorum.

2. Ethereum briefly with example:

Ethereum is a decentralized blockchain platform enabling smart contracts and decentralized apps.

Ex: A smart contract for crowdfunding.

- Funds are collected, until a target is reached.
- If it isn't met, the funds are refunded.

- Smart contracts
- Ethereum virtual machines.
- Token standards.

3. Key differences between Bitcoin and Ethereum:

Bitcoin	Ethereum.
Digital currency for payments.	Platform for smart contracts and dAPPs.
Proof - of - work	Transitioned from POW to proof of stake.
Limited scripting capa - bilities	Turing - complete program - ming.
BTC token	ETH token.
21 Billion BTC	No fixed supply cap for ETH.

4) Three phase commit protocol (3 PC) in blockchain:

- The 3PC ensures consensus and data integrity in distributed systems, reduced the risk of system deadlocks. In blockchain, it ensures transaction reliability.

1. Prepare phase:

- co-ordinator sends a "prepare" message
- Participants validate the transaction.

2. Pre-commit phase:

- co-ordinator sends a pre-commit message if all participants agree
- Participants acknowledge readiness to commit

3. commit phase:

co-ordinator sends a commit message to finalize the transaction.

5. How blockchain enables secures and transparent bitcoin payments:

steps in verifying bitcoin payments:

- Initiate payment
- Broadcast transaction
- verification
- Add to blockchain
- confirmation.

Benefits:

- Transparency.
- Security.

6. Advantages and challenges of permissionless blockchain:

Advantages:

1. Decentralization:
   No single point of control.
2. Transparency:
   All transactions are public and auditable
3. Security:
   cryptographic mechanisms ensures transaction integrity.

challenges:

1. Data privacy.
2. Scalability
3. Governance.

7.) Proof-of-work (PoW) and Sustainability challenge

i. Miners solve a complex cryptographic puzzle t
validate transactions.

iii) The first miner to solve it adds the block to the blockchain and recieves a reward.

Energy consumption:

- PoW requires immense computational power, leading to high electricity usage.

Sustainability challenges:

1. Environmental Impact
2. Ineffeciency
3. Centralization risk.