Sure Laddu! Yeh raha donon papers (May 2022 & May 2024 - CS-802) ke **Hinglish mein detailed answers with questions** ka document:

✅CS-802 (May 2022) Answers with Questions

Q1.

a) **Define the three major characteristics of money that Bitcoin possesses.**

Answer: 1. **Decentralized:** Bitcoin kisi bhi central authority (jaise bank ya govt) se control nahi hota. Sab kuch peer-to-peer network par hota hai. 2. **Limited Supply:** Sirf 21 million bitcoins hi issue kiye ja sakte hain, jisse iska value inflation-proof hota hai. 3. **Divisibility:** 1 Bitcoin ko 10^8 parts mein divide kiya ja sakta hai, jise Satoshi kehte hain.

b) **Differentiate between public versus private block chain.**

Answer: - **Public Blockchain:** Fully open network, jise koi bhi join kar sakta hai (jaise Bitcoin, Ethereum). Zyada transparent hota hai. - **Private Blockchain:** Access controlled hota hai. Sirf authorized members hi participate karte hain (jaise Hyperledger Fabric). Fast aur secure hota hai lekin centralized bhi hota hai.

Q2.

a) **Describe four components of block chain technology.**

Answer: 1. **Distributed Ledger:** Har node ke paas transactions ka copy hota hai. 2. **Consensus Mechanism:** Agreement pe pahuchne ka process between nodes (like PoW, PoS). 3. **Smart Contracts:** Auto-executing codes based on conditions. 4. **Cryptographic Hashing:** Secure data representation using algorithms like SHA-256.

b) **What is a Hash function? Write down the properties of a Hash function.**

Answer: - Hash function ek mathematical algorithm hai jo input ko fixed-size output mein convert karta hai (hash).

Properties: 1. Deterministic 2. Pre-image resistance 3. Collision resistance 4. Avalanche effect 5. Fast computation

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Q3.

a) **Discuss the working of a digital signature.**

Answer: - Sender apne private key se data sign karta hai. - Receiver sender ki public key se verify karta hai. - Isse authenticity, non-repudiation aur integrity ensure hoti hai.

b) **Discuss whether a public block chain requires its own native cryptocurrency to provide incentives to its validator network.**

Answer: Haan, public blockchains native cryptocurrency ka use karte hain validators ko reward dene ke liye (jaise Bitcoin miners ko BTC). Ye system ko secure aur honest banaye rakhta hai.

Q4.

a) **Describe the process of PoW.**

Answer: - Miner ek random number (nonce) guess karta hai takki final hash target value se chhoti aaye. - Ye kaafi computationally expensive process hai. - Correct solution milne par block add hota hai aur reward milta hai.

b) **Discuss why an organization might decide to implement a block chain solution?**

Answer: - Transparency, traceability, immutability - Better efficiency and faster processing - Remove middlemen - Automated workflow with smart contracts

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Q5.

a) **Identify potential issues that companies face with smart contracts in the supply chain.**

Answer: - Lack of legal framework - Integration issues with existing systems - Bugs ya errors in contract code - Difficulties in updating contracts

b) **What are the design issues for permissioned block chain?**

Answer: - Proper access control - Identity management - Scalability challenges - Suitable consensus mechanism like PBFT

Q6.

a) **Explain Lamport-Shostak-Pease BFT algorithm.**

Answer: - Ye algorithm 3-phase protocol use karta hai consensus ke liye even agar kuch nodes faulty ya malicious hon. - 3f + 1 rule ke according agar maximum f faulty nodes hon to consensus possible hai.

b) **Give a brief note on distributed consensus in closed environment.**

Answer: - Closed environment mein nodes trusted hote hain. - Faster consensus algorithms (RAFT, PBFT) use hote hain. - Data access limited hota hai.

Q7.

a) **How block chain is revolutionizing the traditional business network? Explain with example.**

Answer: - Traditional businesses mein multiple intermediaries hote hain. - Blockchain se middlemen hat jaate hain. - Example: Supply chain mein real-time tracking & automation possible hoti hai.

b) **Why Know Your Customer (KYC) is important in financial area?**

Answer: - Money laundering prevention - Customer verification - Regulatory compliance - Blockchain KYC data ko secure aur accessible banata hai.

Q8. Write short notes on:

i) **Hyperledger fabric:** IBM ka permissioned blockchain platform, modular aur scalable.

ii) **Ripple and Corda:** Ripple – cross-border payment ke liye, Corda – enterprise-level blockchain for financial institutions.

iii) **Cross border payments:** Blockchain se faster, low-cost, aur transparent global transactions possible hain.

✅CS-802 (May 2024) Answers with Questions

Q1.

a) **What are the key differences between public, private and consortium blockchains, and what are some use cases for each type?**

Answer: - **Public Blockchain:** Open for all, permissionless. Example: Bitcoin, Ethereum. Use case: Cryptocurrency, public voting. - **Private Blockchain:** Controlled access. Only specific nodes can participate. Example: Hyperledger Fabric. Use case: Internal company data sharing. - **Consortium Blockchain:** Multiple organizations control it. Example: R3 Corda. Use case: Inter-bank settlements, trade finance.

b) **What are Merkle Tree? How importance are Merkle Tree in Blockchain?**

Answer: - Merkle Tree ek hash-based binary tree hai jisme leaves represent karte hain transaction hashes ko. - Importance: - Efficient verification of transactions - SPV (Simplified Payment Verification) - Tamper-proof data structure

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Q2.

a) **What are some common validation techniques used in blockchain systems, such as proof-of-work and proof-of-stake?**

Answer: - **Proof of Work (PoW):** Miners ko complex problem solve karna padta hai. Energy intensive but secure. - **Proof of Stake (PoS):** Validators apne coins stake karte hain. Energy efficient, faster. - **Other techniques:** DPoS, PBFT, PoA (Proof of Authority)

b) **What is Double Spending? Is it possible to double spend in a Blockchain system?**

Answer: - Double spending ka matlab ek hi coin ko multiple baar use karna. - Blockchain ke consensus aur timestamping mechanism se isse roka ja sakta hai. Isliye properly designed blockchain mein double spending almost impossible hota hai.

Q3.

a) **What are some practical applications of Byzantine fault tolerant systems, and how are they used in industry?**

Answer: - Fault-tolerant systems jaise PBFT consensus use hote hain: - Financial sector - Supply chain - Distributed databases - Mission-critical systems (aircraft, nuclear plants)

b) **Discuss design issues for permissioned blockchains and use cases.**

Answer: - Access control - Identity and key management - Regulatory compliance - Scalability and performance - Use case: Banking systems, KYC platforms, inter-company settlement networks

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Q4.

a) **How do traditional cross-border payment methods differ from blockchain-based methods in terms of speed, cost and security?**

Answer: - **Traditional:** Slow (3–5 days), expensive (intermediaries), less transparent - **Blockchain:** Real-time or near-instant, low transaction fees, transparent & immutable ledger

b) **Compare HashCash PoW (Proof of Work) with Bitcoin PoW. Also discuss various types of attacks on PoW.**

Answer: - **HashCash PoW:** Originally for email spam protection - **Bitcoin PoW:** Based on SHA-256, used for mining blocks - **Attacks:** - 51% attack - Sybil attack - Selfish mining

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Q5. Explain the following terms:

a) **Byzantine algorithm** – Consensus in presence of malicious nodes. Ensures all honest nodes agree.

b) **Proof of Elapsed Time (PoET)** – Intel-based consensus where wait time decides winner. Used in permissioned blockchains.

c) **Digital Signature** – Cryptographic technique using private-public key for ensuring message authenticity.

Q6.

a) **What is Hyperledger Fabric and how does it differ from other blockchain platforms?**

Answer: - Modular, permissioned blockchain platform - Allows plug-and-play consensus - Data privacy via channels - Differentiator: Not token-based, suited for enterprise use

b) **How Bitcoin related with blockchain? Write the various steps of creation in Coins.**

Answer: - Bitcoin is built on blockchain technology - Steps: - Miner verifies transaction - Solves PoW - Creates new block - Adds to blockchain - Receives new bitcoins as reward

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Q7.

a) **Which cryptographic algorithm used in Blockchain? Explain in detail.**

Answer: - SHA-256 (used for hashing blocks) - ECDSA (Elliptic Curve Digital Signature Algorithm – for signing transactions) - AES (Advanced Encryption Standard – for data encryption)

b) **What is a smart contract and how is it used in the Ethereum blockchain?**

Answer: - Smart contract = self-executing program on Ethereum - Stored on blockchain - Executes automatically when conditions met - Use: Voting, escrow, token distribution, crowdfunding

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Q8. Explain the following term (any three):

a) **Transaction validation:** Verifying integrity, authenticity and eligibility of a transaction before adding to block.

b) **Know your customer (KYC):** Regulatory process to verify identity of clients.

c) **Crypto currency:** Digital currency secured by cryptography (e.g., BTC, ETH)

d) **Creation of coin:** New coins generated via mining or minting (PoW or PoS)