Sure Laddu! Here is the detailed answer key in **Hinglish** for all 8 questions from the "Blockchain Technologies" (AL-802) May 2024 exam paper:

Q1.

a) Public Ledger kya hota hai aur financial transactions mein kaise kaam karta hai? Public ledger ek aisi digital record book hoti hai jisme saari transactions transparent tareeke se record hoti hain. Blockchain public ledger ka best example hai. Ye ledger decentralized hota hai, jisme sabhi users ko access hota hai aur koi bhi transaction sabke saamne visible hoti hai. Isse transparency aur trust badhta hai.

b) Smart Contracts kya hote hain aur unke use cases? Smart Contracts self-executing digital agreements hote hain jinke terms coding ke form mein blockchain par stored hote hain. Jab predefined conditions meet hoti hain, tab ye automatic execute ho jaate hain. Use Cases: - Supply chain automation - Insurance claim processing - Real estate agreements - Voting systems

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Q2.

a) Block ka concept in blockchain aur overall structure mein uska role? Blockchain mein block ek data container hota hai jisme kuch specific information hoti hai: - Previous block ka hash - Transactions ka list - Timestamp - Nonce (PoW ke liye) Har block ek chain mein connected hota hai using hash, jo data ko tamper-proof banata hai.

b) Merkle Tree ka concept aur uska use in data verification? Merkle tree ek binary tree structure hota hai jisme leaf nodes transactions ko represent karte hain aur har non-leaf node unka hash. Benefits: - Fast verification - Secure data integrity check - Efficient SPV (Simplified Payment Verification) in Bitcoin

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Q3.

a) Bitcoin Peer-to-Peer (P2P) Network kya hota hai? P2P network mein users direct ek dusre ke saath connect hote hain bina kisi central server ke. Bitcoin mein har node equal hoti hai aur woh blocks validate, broadcast, aur sync karti hai. Benefits: - Decentralization - Fault tolerance - Faster and borderless transactions

b) HashCash Proof of Work kya hota hai? HashCash PoW ek consensus mechanism hai jisme miners ek mathematical problem solve karte hain (finding nonce). Yeh kaafi computing power mangta hai, isse Bitcoin network secure hota hai kyunki attackers ko bhi wahi energy aur time dena padega.

Q4.

a) Bitcoin mining ke daily challenges aur routines kya hote hain? - High computational power requirement - Electricity cost - Mining pool competition - Difficulty level adjustment

b) In challenges ka Bitcoin network pe kya effect padta hai? - Network secure banta hai - Consistent block creation time - Centralization risk thoda badhta hai (due to big mining farms)

Q5.

a) Permissioned blockchain implement karne ke design considerations: - Access control policies (kaun data access kar sakta hai?) - Identity management - Consensus protocol selection (PBFT, RAFT) - Governance and compliance rules

b) Paxos Algorithm kya hai aur iska role in distributed consensus: Paxos ek consensus algorithm hai jo ensure karta hai ki distributed systems mein sabhi nodes ek common decision pe pahunch sakein, even agar kuch nodes fail ho jaayein. Yeh consistency aur fault-tolerance ensure karta hai.

Q6.

a) Byzantine General Problem kya hai? Yeh ek hypothetical situation hai jisme multiple generals ko ek city pe attack karna hai but communication unreliable hai. Blockchain mein iska matlab hota hai ki agar kuch nodes galat ya malicious hain toh bhi poore system ka consensus kaise achieve ho.

b) Lamport-Shostak-Pease Algorithm kaise Byzantine Fault handle karta hai? Yeh algorithm multi-round message passing ka use karta hai jisme har node baaki nodes ke responses ko verify karta hai. Agar majority honest hai, toh faulty nodes ke hone ke bawajood consensus possible hota hai.

Q7.

a) KYC Process ke key components aur financial institutions ke liye importance: - Identity verification - Address verification - Risk assessment and monitoring Blockchain KYC records ko immutable aur sharable banata hai, jisse cost aur time dono kam hote hain.

b) Blockchain ka impact on global trade & supply chains: - Real-time tracking - Fraud prevention - Transparent documentation - Faster cross-border payments Yeh sab trade ko efficient aur secure banata hai.

Q8. Short Notes:

a) Supply Chain Financing: Blockchain se suppliers ko real-time invoice verification milta hai, jisse unko jaldi payments milti hain aur risk kam hota hai.

b) Ripple and Corda: - **Ripple**: Cross-border payments ke liye use hota hai. - **Corda**: Financial sector ke liye designed DLT platform hai jo privacy aur legal agreements pe focus karta hai.

c) Smart Contract Life Cycle: Stages: 1. Creation (code likhna) 2. Deployment 3. Execution (condition satisfy hone pe) 4. Termination (self-destruct ya expiry)

d) Permissioned Blockchain: Private network hota hai jisme sirf authorized users hi access le sakte hain. Example: Hyperledger Fabric.

e) Fintech Sector: Blockchain se Fintech mein transparency, efficiency, aur cost-saving aati hai. Use cases: P2P lending, asset tokenization, digital wallets.

Let me know agar aapko PDF ya printable format chahiye Laddu! Ya kisi answer mein diagram/flowchart bhi chahiye toh batao! 😊