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Assignment 6

Q1] The Ethereum Virtual Machine (EVM) is a crucial components of Ethereum's blockchain architecture. Discuss the role of the EVM in enabling smart contract and decentralized application, how EVM ensure security and efficiency in executing smart contracts compared to traditional VMs?

⇒ The EVM is the cornerstone of Ethereum's blockchain, providing the environment for executing smart contracts

Smart contract execution: The EVM designed to execute code written in solidity when Smart contract is deployed to Ethereum, it's code is compiled to Bytecode, which is then stored in Block chain.

Decentralized applications: Dapps are application that leverage smart contract to provide decentralized services. The EVM enables the creation of these dApps by providing a platform for executing the logic and rule governing their operation.

Ensuring security and Efficiency Compared to traditional virtual machines

Sandboxing: The EVM operates in sandboxed environment, meaning that smart contract cannot interact directly with the underlying operating system or network.

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Determinism: The EVM is deterministic, meaning that same input will always produce same output. this ensures that smart contract execution are consistent and predictable, which is essential for their reliability.

Gas Mechanism: Ethereum uses a gas mechanism to limit the computational resource that can be consumed by transaction This prevents malicious or resource-intensive smart contracts from overwhelming the network.

Solidity Compiler: The solidity compiler optimizes smart contract code to reduce gas consumption, improving efficiency.

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Q2] Compare the workflow and transaction processes in Bitcoin and Ethereum Blockchain. How do the difference in their architecture and consensus mechanism influence their respective use case and performance in handling transactions?

⇒ Workflow and transaction

Bitcoin :

Workflow ⇒ Miners solve cryptographic puzzles to create new blocks, Each blocks contains a list of transaction, when a transaction is verified, it is added to the mempool, a pool of unconfirmed transaction. Miners select transaction from the mempool to include in the next block they create.

Transaction process ⇒ Bitcoin transaction primarily involve transferring digital currency from one address to another. The transaction includes the sender's address, recipient address amount to be transferred and a digital signature to prove the sender's authority.

Ethereum :

Workflow : Similar to Bitcoin, miners create new blocks containing transactions, However Ethereum blocks can also contain smart contracts deployments or interactions

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Difference in Architecture and Consensus Mechanism

Architecture: Bitcoin is primarily a payment network, while Ethereum is a platform for building decentralized application. Bitcoin focuses on simple transaction while Ethereum support more complex operation.

Consensus Mechanism: Bitcoin uses Proof of work where miners compete to solve cryptographic puzzle, initially Ethereum used same but now has transitioned to proof of stake, where validator stake their ether to participate in the consensus process.