Centurion University
Shaping Lives... Empowering Communities...

School: ..... Campus: .....

Academic Year: ..... Subject Name: ..... Subject Code: .....

Semester: ..... Program: ..... Branch: ..... Specialization: .....

Date: .....

Classroom Learning

(Learning by Listening and Observations)

Name of the Topic: Peers

Learning Outcome:

Concepts learned (Mention 2/3 principles):

Based on the classwork, the principal concepts I have learned include:

1. The fundamental concept of a peer as a participant in a blockchain network, where each node is an equal member (peer) in a decentralized peer-to-peer (P2P) architecture.
2. The complete structure of how peers interact directly with each other without a central server, forming a resilient and fault-tolerant network.
3. The characteristics of peer discovery and communication protocols that allow the network to self-organize and propagate data efficiently.

* New techniques learned:

Additionally, I have acquired new knowledge in the following areas:

1. Techniques for how new peers discover and connect to existing peers in the network using bootnodes or seed nodes.
2. Procedures for the "gossip protocol," where peers broadcast and relay transactions and blocks to their immediate neighbors, ensuring network-wide dissemination.
3. The process of how peers independently validate incoming transactions and blocks against the network's consensus rules before forwarding them.
4. Methods for managing peer connections, including maintaining a list of active peers and handling incoming/outgoing connection requests.

* Related Project/Practice work experienced and learned:

During the practice sessions of the lab work, I engaged in and developed proficiency with simulations in the following areas:

1. Setting up a private Ethereum-based blockchain network using tools like Ganache, which creates a set of interconnected peers for testing.
2. Writing scripts to connect to a peer node using Web3.js or Ethers.js libraries to query blockchain data (e.g., block height, account balances).
3. Simulating a simple P2P network where peer nodes pass messages (simulating transactions) to each other.
4. Observing how a transaction submitted to one peer propagates through the entire network of connected peers.

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* New Software/Machine/Tool/Equipment/Experiment learned:

During the lab session, I used **Geth (Go-Ethereum)** to establish a peer connection to the Ethereum network and **Ganache** to create a local network of simulated peers. I also used MetaMask as a light client peer to interact with these networks.

* Application of concept(s) (preferably real life scenario):

1. **Data Redundancy:** Every peer (full node) maintains a full copy of the blockchain, ensuring no single point of failure and making data tampering extremely difficult.
2. **Censorship Resistance:** Since there is no central server to attack or shut down, a transaction broadcast to any peer will eventually reach the entire network, preventing censorship.
3. **Trustless Verification:** Any peer can independently verify the entire history of transactions without relying on a trusted third party, enabling true trustless interaction.

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* Case Studies/Examples:

1. **Global Bitcoin Network:** A peer in Tokyo can relay a transaction to a peer in Berlin, which then relays it to peers in New York, creating a robust and decentralized payment system without borders.
2. **Interplanetary File System (IPFS):** While not a blockchain, IPFS uses a peer-to-peer network model similar to blockchain for storing and sharing hypermedia in a distributed file system, demonstrating the wider application of P2P architecture.
3. **Validator Peers in PoS:** In Proof-of-Stake networks like Ethereum, validator peers are responsible for proposing and attesting to new blocks. Their collective work secures the network, and their identity as peers is fundamental to consensus.

Assessment:

Marks Obtained: ..... / 10

Signature of the Faculty:

Signature of the Student:

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**As applicable according to the topic.*
One sheet per topic (10-20) to be used.