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

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

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

Date: ....

Applied and Action Learning
(Learning by Doing and Discovery)

Name of the Experiement : Build the Network – Peer-to-Peer Simulation

Objective/Aim:

To understand the concept of a peer-to-peer (P2P) network by simulating how blockchain nodes connect, share data, and achieve synchronization without a central server.

Apparatus/Software Used:

- Laptop
- Remix IDE
- MetaMask
- Pinata(IPFS)
- Vs code

Theory/Concept:

Theory / Concept:

- A peer-to-peer network is a distributed system where all nodes are equal participants (peers).
- Each peer stores a copy of the ledger and validates transactions independently.
- When one peer updates data (like a transaction), it broadcasts it to other peers.
- This decentralized communication forms the foundation of blockchain networks such as Bitcoin and Ethereum.

Key Components:

- Nodes: Participants that maintain blockchain data.
- Blocks: Data structures containing transactions.
- Broadcasting: Mechanism for sharing updates among nodes.

Procedure:

Step 1: Set up multiple nodes in the simulation, each capable of sending and receiving messages autonomously

Step 2: Implement peer discovery protocols where nodes identify and connect to other nodes

Step 3: Simulate message broadcasting where a transaction or block is sent from one node and relayed to peers until all nodes receive it

Step 4: Introduce network latency, message loss, or node failures to observe network robustness

Step 5: Optionally, implement simple consensus or validation logic to mimic blockchain operations

Step 6: Monitor the network to verify successful data propagation and node synchronization

Observation Table:

Observation Table

Step	Action	Peer A Status	Peer B Status	Peer C Status	Network State
1	Initial state	☑ Valid	☑ Valid	☑ Valid	All peers synchronized
2	Modify Block #2 in Peer A	✕ Invalid	☑ Valid	☑ Valid	Peer A out of sync
3	Mine Block #2 in Peer A	☑ Valid	☑ Valid	☑ Valid	Peer A valid but different data
4	Manually sync B & C with A	☑ Valid	☑ Valid	☑ Valid	All peers synchronized again

ASSESSMENT

Rubrics	Full Mark	Marks Obtained	Remarks
Concept	10		
Planning and Execution/ Practical Simulation/ Programming	10		
Result and Interpretation	10		
Record of Applied and Action Learning	10		
Viva	10		
Total	**50**		

Signature of the Student:

Signature of the Faculty:

Name :
Regn. No.