Centurion University
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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 : Stake Your Claim – Proof of Stake Simulation

Objective/Aim:

To study and simulate the **Proof of Stake (PoS)** mechanism by selecting validators based on their staked cryptocurrency, showing how blocks are verified efficiently without intensive computations like in **Proof of Work (PoW)**.

Apparatus/Software Used:

- Laptop
- Remix IDE
- MetaMask
- Vs code
- Ganache

Theory/Concept:

Proof of Stake (PoS) is a blockchain consensus method designed as an alternative to **Proof of Work (PoW)** to make block validation faster and more energy-efficient.
In PoS, validators are chosen based on the number of tokens they are willing to **lock (stake)** in the network. The higher the stake, the higher the chance of being selected to validate a new block.

If a validator behaves dishonestly or tries to tamper with data, they lose part of their staked amount through a process known as **slashing**. This system encourages honest participation by making attacks financially risky.

Key Features of Proof-of-Stake:

1. **Energy Efficiency:**
   PoS consumes far less power since it doesn't rely on solving mathematical puzzles like PoW.

2. **Fair Validator Selection:**
   Validators are selected using a mix of stake amount, randomness, and reputation metrics to ensure fairness.

3. **Security through Staking:**
   Validators put their funds at risk, ensuring economic discipline and discouraging fraud.

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Procedure:

- **Start the Local Blockchain:**
  Open **Ganache** to create a private Ethereum test network.
- **Deploy the PoS Smart Contract:**
  Use **Remix IDE** to write and deploy a contract that represents the staking and validation process.
- **Register Validators:**
  Connect multiple **MetaMask** accounts and allow each to stake tokens in the contract.
- **Random Validator Selection:**
  Implement a random selection logic within the contract so that validators are chosen automatically for each block round.
- **Simulate Block Validation:**
  The selected validator confirms the block and earns a reward credited to their account balance.
- **Demonstrate Slashing (Optional):**
  Introduce a malicious validator scenario to show how the system deducts part of their stake for dishonest behavior.
- **Record Observations:**
  Note how often each validator is chosen, the rewards distributed, and the low computational power usage compared to PoW.

Observation Table:

Validator ID	Amount Staked	Times Selected	Reward Earned	Remarks
Validator 1	10 ETH	2	0.5 ETH	Honest
Validator 2	20 ETH	3	0.8 ETH	Honest
Validator 3	15 ETH	1	0.2 ETH	Penalized (slashing)

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 faculty

Signature of the student
Name:
Regn. No: