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

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

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

Date: ....

Centurion
UNIVERSITY
Shaping Lives...
Empowering Communities...

Applied and Action Learning
(Learning by Doing and Discovery)

Name of the Experiement : **PoW vs PoS – Consensus Mechanism Comparison**

Objective/Aim:

To compare and analyze the working principles, strengths, and limitations of Proof of Work (PoW) and Proof of Stake (PoS) consensus mechanisms, focusing on their security, energy efficiency, scalability, and practical implications in blockchain networks

Apparatus/Software Used:

- Simulation or testnet blockchain environments
- Blockchain explorers
- blockchain technical documentation

Theory/Concept:

PoW and PoS are blockchain consensus protocols that ensure integrity and agreement on distributed ledgers without the need for central authority. PoW depends on miners cracking cryptographic puzzles with high computational power, ensuring strong security but at high energy expenditure.

PoS chooses validators according to their stake in the network—in other words, their ownership of cryptocurrency—and offers more energy efficiency and faster confirmation times but with the issues of wealth-based centralization and possible security complications.

Procedure:

- Set up two separate blockchain test environments: one operating under PoW (e.g., Bitcoin/Ethereum pre-merge) and another under PoS (e.g., Ethereum 2.0, Cardano).

- Configure network nodes and deploy smart contracts or initiate test transactions.

- Monitor and record metrics related to block validation time, transaction throughput, energy/resource usage, and network participation.

- Introduce potential adversarial scenarios (e.g., Sybil or double-spend attempts) to assess security robustness.

- Collect and analyze data on network behavior, scalability, decentralization, and validator rewards.

Observation:

- PoW-based network shows higher energy consumption and slower transaction confirmation but robust security against attacks due to computational cost

- PoS-based network achieves greater efficiency, faster transactions, and lower environmental impact, but may involve some centralization risks if stake is unevenly distributed among participants.

- Both mechanisms successfully prevent double-spending and maintain consensus but differ significantly in scalability, ecological footprint, and validator selection approach.

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:

Name :

Signature of the Faculty:

Regn. No. :

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*As applicable according to the experiment.
Two sheets per experiment (10-20) to be used.*