**GTU MCA SEM 3 Research Paper**

Title: A Research Study on Blockchain Technology and NFT-based Digital Ownership System

Students: Aayush Solanki, Urvisha Panchal, Mahenoor Enrollment Numbers: To be added Department: Master of Computer Applications (MCA) Institute: Kalol Institute of Technology Guide Name: To be added Academic Year: 24-25

**Abstract:** This research paper explores the emerging technologies of Blockchain and Non-Fungible Tokens (NFTs), focusing on their applications in digital ownership systems. NFTs represent unique digital assets whose authenticity and ownership are verified using Blockchain technology. This study investigates the principles, frameworks, advantages, challenges, and future prospects of NFT-based systems, providing detailed analysis and implementation guidelines.

**Keywords:** Blockchain, NFT, Digital Ownership, Smart Contracts, Ethereum, Decentralized Ledger

**1. Introduction** - Overview of Blockchain Technology - Emergence of NFTs - Importance in digital ownership

**2. Background and Literature Review** - History of Blockchain - Previous research on NFTs - Comparison with traditional digital assets

**3. Problem Definition** - Challenges in digital ownership verification - Issues with copyright, fraud, and centralized platforms

**4. Objectives of the Study** - To understand Blockchain mechanisms - To design an NFT-based digital ownership system - To analyze security and transparency advantages

**5. Proposed System / Methodology** - Use of Ethereum Blockchain and Smart Contracts - NFT minting and transfer process - Decentralized storage (IPFS)

**6. System Architecture** - Textual description of architecture: - User Interface (Web/Mobile) - Smart Contract Layer - Blockchain Network (Ethereum) - Storage Layer (IPFS/Cloud)

**7. Modules Description** - User Authentication Module - NFT Minting Module - Ownership Transfer Module - Transaction Logging Module

**8. Technology Stack** - Frontend: React.js, Tailwind CSS - Backend: Node.js, Express.js - Blockchain: Ethereum, Solidity - Storage: IPFS, MongoDB

**9. Implementation Details** - Smart Contract Development - Web3.js Integration - Frontend-Backend Interaction - NFT Metadata Handling

**10. Result Analysis / Findings** - NFT transactions verified via blockchain - Ownership transparency achieved - Security and immutability ensured

**11. Advantages & Limitations** - Advantages: Transparency, Security, Decentralization, Authenticity - Limitations: Gas fees, Scalability issues, Environmental concerns

**12. Future Scope** - Cross-chain NFTs - Integration with AR/VR platforms - Enhanced scalability solutions

**13. Conclusion** - NFTs and Blockchain provide robust solutions for digital ownership - Potential for future applications in multiple industries

**14. References / Bibliography (APA format)** 1. Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. 2. Wood, G. (2014). Ethereum: A Secure Decentralised Generalised Transaction Ledger. 3. Christidis, K., & Devetsikiotis, M. (2016). Blockchains and Smart Contracts for the Internet of Things. IEEE Access, 4, 2292–2303. 4. Saleh, F. (2021). Blockchain without Waste: Proof-of-Stake. The Review of Financial Studies, 34(3), 1156–1190. 5. Wang, Q., & Kogan, A. (2020). Designing Privacy-Preserving Blockchain-Based Systems. Journal of Management Information Systems, 37(2), 532–563.

**15. Acknowledgment** We sincerely acknowledge the guidance and support provided by our faculty, department, and peers during this research work.