SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES (AUTONOMOUS)

QUESTION BANK

Year / Semester: III B.Tech VI Semester **Regulation: R23**

Subject and Code: 23CAI363A

Subject: Block Chain For AI

SYLLABUS

UNIT I: Blockchain Fundamentals and Architecture

Introduction to Blockchain Technology, Components: Blocks, Hashing, Merkle Trees, Types of Blockchains: Public, Private, Consortium, Distributed Ledger Technology (DLT) and P2P Networks, Blockchain Structure and Mining, Use Cases and Evolution of Blockchain.

UNIT II: Smart Contracts and Consensus Mechanisms

Smart Contracts: Definition, Features, Use Cases, Ethereum and Solidity Basics, Consensus Algorithms: PoW, PoS, DPoS, PBFT, Gas, Transactions, and Events in Ethereum, Hyperledger Fabric: Architecture and Chaincode, Deployment and Testing of Smart Contracts.

UNIT III: Integration of Blockchain and AI

Motivation for Integrating Blockchain with AI, Decentralized AI Models and Federated Learning, Secure Model Sharing and Provenance, Blockchain for Data Integrity in AI Systems, AI for Blockchain (e.g., optimizing consensus), Case Study: Decentralized AI Marketplace.

UNIT IV: Applications of Blockchain in AI Systems

Blockchain for Explainable and Trusted AI, Applications in Healthcare and Genomics, Blockchain for Autonomous Vehicles and IoT, Financial AI Systems with Smart Contracts, Supply Chain and Logistics Intelligence, NFT-based AI Applications (Digital Identity, IP).

UNIT V: Security, Privacy and Challenges in Blockchain-AI

Security Challenges: Sybil Attacks, 51% Attacks, Privacy Preservation and Zero Knowledge Proofs, Scalability and Energy Concerns in Blockchain-AI, Ethical and Legal Concerns in AI with Blockchain, Interoperability of Blockchain Platforms, Future Trends: Quantum-Resistant Blockchain- AI.

Prepared by Mr.J.Sheik Mohamed

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Max Marks: 10

S.No.	CO1	Questions	BT
Unit I: Blockchain Fundamentals and Architecture			
1	**1**	Define Blockchain Technology. Explain its key components of Blocks, Hashing, and Merkle Trees.	**L1**
2	**1**	List and describe the types of blockchains: Public, Private, and Consortium blockchain with suitable examples	**L1**
3	**1**	Explain the structure of a blockchain with a neat diagram. Describe how blocks are linked using cryptographic hash functions By Using SHA-256.	**L2**
4	**1**	Illustrate how blockchain technology can be applied in supply chain management to improve transparency and traceability.	**L3**
5	**1**	Demonstrate how a transaction is verified and added to a blockchain network like Bitcoin. Explain the role of mining in this process.	**L3**
6	**1**	Compare and analyze Public, Private, and Consortium blockchains in terms of decentralization, security, scalability, and use cases.	**L4**
7	**1**	Evaluate the advantages and limitations of blockchain technology in real-world applications. Illustrate your answer with relevant Instance Ethereum.	**L5**
8	**1**	Design a basic blockchain architecture for a secure digital voting system. Justify your choice of blockchain type, consensus mechanism, and network structure.	**L6**
9	**1**	**a)** Develop a blockchain-based e-voting system ensuring transparency and voter privacy. Outline the system architecture. **5 marks** **b)** Formulate a mining/validation process suitable for the proposed voting system and justify your approach. **5 marks**	**L6**
10	**1**	**a)** Construct a blockchain model for maintaining secure healthcare records using Distributed Ledger Technology **5 marks** **b)** Design a mechanism using hashing techniques such as SHA-256 to ensure data integrity in the healthcare system. **5 marks**	**L6**

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S.No.	CO2	Questions	BT
Unit II: Smart Contracts and Consensus Mechanisms			
1	2	Define Smart Contracts. List their key features and advantages.	L1
2	2	Explain the basic architecture of Ethereum and list its main components.	L1
3	2	Explain the working of Proof of Work (PoW) with a suitable example With Bitcoin.	L2
4	2	a) Describe the structure of a smart contract in Solidity. **5 Marks** b) Explain the role of Ethereum Virtual Machine (EVM) in executing smart contracts. **5 Marks**	L2
5	2	a) Show how Gas cost affects transaction execution in Ethereum. b) Apply PBFT consensus in a banking network scenario.	L3
6	2	Compare and analyze PoW and PoS in terms of security, energy consumption, scalability, and decentralization.	L4
7	2	Analyze the architecture of Hyperledger Fabric and explain how it differs from Ethereum.	L4
8	2	a) Compare PoW and PoS based on security and energy efficiency. **5 Marks** b) Analyze Delegated Proof of Stake (DPoS) and its scalability advantages. **5 Marks**	L4
9	2	a) Apply Proof of Stake (PoS) consensus in a cryptocurrency transaction validation process. **5 Marks** b) Show how validators are selected and rewarded in PoS. **5 Marks**	L3
10	2	Demonstrate the deployment and testing steps of chaincode in Hyperledger Fabric.	L3

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S.No.	CO3	Questions	BT
UNIT III: **Integration of Blockchain and AI**			
1	**3**	Define Federated Learning. List its key components and explain its relevance to decentralized AI.	**L1**
2	**3**	Define data provenance and model sharing in the context of AI systems.	**L1**
3	**3**	Explain how blockchain ensures data integrity in AI systems.i Illustrate with examples.	**L2**
4	**3**	Describe the concept of decentralized AI models. How do they differ from centralized AI models?	**L2**
5	**3**	Explain how AI can be used to optimize blockchain consensus mechanisms?	**L2**
6	**3**	Demonstrate how a decentralized AI marketplace can operate using blockchain technology?	**L3**
7	**3**	Illustrate how blockchain can securely store and verify AI model updates.	**L3**
8	**3**	Apply AI techniques to predict energy consumption in Proof of Work (PoW) blockchain networks.	**L3**
9	**3**	Compare and analyze centralized AI vs. decentralized AI in terms of security, privacy, and scalability.	**L4**
10	**3**	Analyze the role of blockchain in ensuring provenance and accountability of AI models.	**L4**

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S.No.	CO4	Questions	BT
UNIT IV: Applications of Blockchain in AI Systems			
1	**4**	Define Explainable AI (XAI) and describe how blockchain can support trusted AI.	**L1**
2	**4**	List three applications of blockchain in healthcare and genomics.	**L1**
3	**4**	Explain how blockchain ensures data integrity and transparency in AI-based healthcare systems.	**L2**
4	**4**	Describe how blockchain can enhance AI for autonomous vehicles and IoT networks.	**L3**
5	**4**	a)Explain the role of smart contracts in financial AI systems**. 5 Marks** b) Describe how AI can automate transactions using blockchain. **5 Marks**	**L2**
6	**4**	a)apply blockchain-based security for genomic data used in AI analytics. b) Show how federated learning with blockchain can protect sensitive data.	**L3**
7	**4**	a)Explain the workflow of a decentralized AI marketplace using blockchain**. 5 Marks** b) Describe the benefits of blockchain in ensuring secure transactions and model provenance in the marketplace**. 5 Marks**	**L3**
8	**4**	Describe how blockchain ensures secure sharing of sensitive genomic data for AI analytics. Explain how decentralized AI models maintain privacy and integrity.	**L2**
9	**4**	Explain how blockchain enhances AI-driven supply chain and logistics intelligence.	**L2**
10	**4**	Explain how blockchain contributes to trustworthy IoT and AI systems. Discuss two challenges in integrating blockchain with AI in IoT networks.	**L2**

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S.No.	CO5	Questions	BT
UNIT V: Security, Privacy and Challenges in Blockchain-AI			
1	5	Define Sybil Attack and explain how it affects blockchain networks.	L1
2	5	Define 51%Sybil Attack and mention its impact on blockchain consensus	L1
3	5	List the main security challenges in Blockchain-AI systems.	L1
4	5	List ethical and legal concerns in using AI with blockchain.	L1
5	5	a) Explain how a Sybil attack works in blockchain networks. b) Describe one method to prevent Sybil attacks in Blockchain-AI systems.	L2
6	5	a) Explain the scalability challenges in integrating AI with blockchain. b) Describe how energy consumption becomes a concern in Blockchain-AI systems.	L2
7	5	a) Explain how privacy can be maintained in Blockchain-AI healthcare systems. b) Describe the role of ZKP in ensuring secure data sharing for AI analytics.	L3
8	5	Apply Zero-Knowledge Proofs to preserve privacy in a decentralized AI healthcare application.	L3
9	5	Demonstrate how blockchain can handle scalability and energy challenges in AI-powered systems	L3
10	5	Demonstrate how quantum-resistant techniques can be applied to secure future Blockchain-AI systems.	L3

Note: L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating, and L6-Creating

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