

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Bachelor of Technology (Computer Engineering) SEMESTER - 7 Winter 2025 (Regular)

Course :Bachelor of Technology (Computer Engineering) Branch : Engineering and Technology

Semester : SEMESTER - 7

Subject Code & Name: BTCOE704C - BLOCK CHAIN TECHNOLOGY

Time : 3 Hours]

[Total Marks : 60

Instructions to the Students:

1. Each question carries 12 marks.
 2. Question No. 1 will be compulsory and include objective-type questions.
 3. Candidates are required to attempt any four questions from Question No. 2 to Question No.6
 4. Use of non-programmable scientific calculators is allowed.
 5. Assume suitable data wherever necessary and mention it clearly.
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Q1. Objective type questions. (Compulsory Question)

12

- 1 What is the primary purpose of a public ledger in blockchain?
 - a) To store private user credentials
 - b) To maintain a centralized database
 - c) To record transactions in a transparent and immutable manner
 - d) To execute smart contracts only
- 2 What is the role of Bitcoin scripts?
 - a) To mine new bitcoins
 - b) To validate blocks
 - c) To define transaction spending conditions
 - d) To propagate blocks
- 3 KYC on blockchain improves:
 - a) Identity verification efficiency
 - b) Data redundancy
 - c) Mining speed
 - d) Consensus mechanisms
- 4 What controls access rights in Hyperledger Fabric?
 - a) Mining nodes
 - b) Smart contracts
 - c) Membership Service Provider (MSP)
 - d) Tokens
- 5 Which algorithm formally introduced Byzantine Fault Tolerance?
 - a) Nakamoto Consensus
 - b) Paxos
 - c) RAFT
 - d) Lamport-Shostak-Pease Algorithm
- 6 Ethereum smart contracts are primarily written in:
 - a) Java
 - b) Python
 - c) Go
 - d) Solidity
- 7 In a permissioned blockchain, why is Proof of Work typically unnecessary?
 - a) Transactions are digitally signed
 - b) Nodes already possess trusted identities
 - c) Blocks are smaller in size
 - d) Hash functions are not required
- 8 Which property ensures that a small change in input drastically changes the hash output?
 - a) Determinism
 - b) Pre-image resistance
 - c) Collision resistance
 - d) Avalanche effect
- 9 Which factor adjusts to maintain a consistent block creation time?
 - a) Block size
 - b) Network latency
 - c) Mining difficulty
 - d) Hash rate

- 10 Why is achieving BFT consensus in asynchronous systems especially challenging?
 a) Messages can be delayed indefinitely b) Digital signatures cannot be verified
 c) Nodes cannot store state d) Leaders cannot be elected
- 11 Which environment best suits permissioned blockchains?
 a) Open and anonymous networks b) Closed and controlled networks
 c) Public cryptocurrency networks d) Trustless environments
- 12 Blockchain in cross-border payments mainly helps in:
 a) Increasing intermediaries b) Reducing transparency
 c) Faster and cost-effective transactions d) Increasing transaction fees
- Q2. Solve the following.
- A) What is a digital signature? Name its key elements. Show how a digital signature is generated and verified for a transaction. 6
- B) Differentiate between public and private blockchains, using suitable examples with ANY SIX points. 6
- Q3. Solve the following.
- A) Explain the Bitcoin peer-to-peer network architecture. Explain how Bitcoin prevents the double-spending problem. 6
- B) Define Bitcoin and list its main components. Describe the lifecycle of a Bitcoin transaction. 6
- Q4. Solve Any Two of the following.
- A) Define permissioned blockchain and list its characteristics. Explain design issues in permissioned blockchains. 6
- B) Explain the RAFT consensus algorithm, including the process of leader election, and illustrate the overall RAFT consensus operation using a diagram. 6
- C) Define state machine replication in the context of blockchain systems. Explain how state machine replication ensures consistency in permissioned blockchains. 6
- Q5. Solve Any Two of the following.
- A) Define cross-border payments and state the role of blockchain in facilitating them. Explain how blockchain improves cross-border payment systems. 6
- B) A country faces frequent food contamination, wastage, and hoarding due to a lack of transparency in its food supply chain. To ensure safe, sufficient, and timely access to food for its population, the government plans to implement blockchain technology across farmers, distributors, warehouses, and retailers. Explain how blockchain technology can be used in this scenario to achieve food security, highlighting its role in traceability, transparency, and trust. 6
- C) Design and implement a blockchain smart contract (in pseudocode or Solidity) that automates mortgage verification and approval by validating borrower details, property ownership, and loan eligibility. Explain the contract logic, conditions, and execution flow. 6
- Q6. Solve Any Two of the following.
- A) Define channels in Hyperledger Fabric. Explain the role of Membership Service Provider (MSP) in Hyperledger Fabric. 6
- B) Write a smart contract using a programming language that supports the smart contract functionality in blockchain technology to automate mortgage verification and approval. 6

- C) Analyze and compare Hyperledger Fabric, Ethereum, Ripple, and Corda as blockchain development platforms with respect to 6
- (i) architecture,
 - (ii) smart contract or application development model, and
 - (iii) suitability for enterprise use cases.
- Justify the selection of an appropriate platform for a cross-organization financial application.

*** End ***