

Atal Bihari Vajpayee Indian Institute of Information Technology & Management, Gwalior

IT031: Blockchain Technologies

Major Examination (Session 2023–24)

Maximum Time: 3 Hours

Max Marks: 70

Note: Attempt all questions. Internal choice is provided where applicable.

1. (a) Explain the architecture of a blockchain with neat diagram. (5 Marks) (b) Differentiate between Proof-of-Work and Proof-of-Stake consensus. (5 Marks)
2. **Numerical:** In Bitcoin, a block header contains: - Previous block hash: 0000abc123... - Merkle root: 9f8e76... - Timestamp: 2023 – 05 – 15 - Nonce: 105
If the difficulty target requires first 3 hex digits to be zero, check if the given nonce is valid. (10 Marks)
3. Attempt any two: (a) Explain Hyperledger Fabric architecture. (6 Marks) (b) Role of consensus in Byzantine Fault Tolerance. (6 Marks) (c) Ethereum vs Bitcoin scripting language. (6 Marks)
4. Discuss in detail: (a) Role of blockchain in digital identity management. (6 Marks) (b) How InterPlanetary File System (IPFS) integrates with blockchain. (6 Marks)
5. **Case Study (15 Marks):** The Indian government plans to use blockchain for land registry to ensure immutability and transparency. - Identify potential challenges (legal, technical, scalability). - Suggest a suitable type of blockchain (public/private/consortium). - Propose consensus mechanism and smart contract features.
6. Short answer questions (2 marks each): (a) Forking in blockchain (b) Gas limit (c) Double-spending problem (d) Tokenization (8 Marks)