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

IT031: Blockchain Technologies

Major Examination (Session 2024–25)

Maximum Time: 3 Hours **Max Marks: 65**

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

1. (a) Explain the layered architecture of blockchain with neat diagram. (5 Marks) (b) Discuss the concept of "immutability" in blockchain and why it is critical. (5 Marks)

2. **Numerical/Problem (8 Marks):** A blockchain uses a hash function that produces 4-digit numeric outputs. If the target requires hashes to be less than 2000, check whether the following nonces are valid: Hash(Nonce=25)=1899, Hash(Nonce=41)=2056, Hash(Nonce=72)=0998. Explain reasoning.

3. Attempt any two: (a) Describe Ethereum Virtual Machine (EVM) and its importance. (6 Marks) (b) Compare Proof-of-Stake and Delegated Proof-of-Stake. (6 Marks) (c) Explain sharding as a blockchain scalability solution. (6 Marks)

4. **Pseudo-code Design (10 Marks):** Write pseudo-code for a simple blockchain that: - Initializes a genesis block - Allows adding transactions - Uses SHA-256 for hashing - Ensures previous hash linkage

5. **Case Study (15 Marks):** The Reserve Bank of India (RBI) is considering a Central Bank Digital Currency (CBDC) built on blockchain. - What type of blockchain (public/private/consortium) is most suitable and why? - Identify possible security threats. - Suggest a consensus mechanism and justify it.

6. Short Answer Questions (2 marks each): (a) Blockchain fork types (b) Lightning Network (c) Gas vs Gas Limit (d) 51% attack (e) Oracles in blockchain (10 Marks)