Blockchain: Assignment No. 1

Q. Consider that, you have been tasked to prepare a demo of blockchain concept, illustrate the concept of block, and blockchain using an object oriented program.

Code:

```
#include <bits/stdc++.h>

// Block class
class Block {
public:
    std::string prevHash;
    std::string data;
    std::time_t timestamp;
    std::string hash;

    Block(const std::string &data, const std::string &prevHash)
        : data(data), prevHash(prevHash) {
        timestamp = std::time(0);
        hash = calculateHash();
    }

private:
    std::string calculateHash() {
        std::stringstream ss;
        ss << prevHash << data << timestamp;
        return sha256(ss.str());
    }

    // Simulate a hash function (this is a simplified version)
    std::string sha256(const std::string &input) {
        return input + "hashed"; // Actual hashing logic not implemented here
    }
};

// Blockchain class
class Blockchain {
private:
    std::vector<Block> chain;

public:
    Blockchain() {
        chain.push_back(createGenesisBlock());
    }
```

```
    Block createGenesisBlock() {
        return Block("Genesis Block", "0");
    }

    Block getLatestBlock() {
        return chain.back();
    }

    void addBlock(const std::string &data) {
        Block newBlock(data, getLatestBlock().hash);
        chain.push_back(newBlock);
    }

    void printChain() {
        for (const auto &block : chain) {
            std::cout << "Block #" << &block - &chain[0] + 1 << std::endl;
            std::cout << "Timestamp: " << std::ctime(&block.timestamp);
            std::cout << "Data: " << block.data << std::endl;
            std::cout << "Previous Hash: " << block.prevHash << std::endl;
            std::cout << "Hash: " << block.hash << std::endl << std::endl;
        }
    }
};

int main() {
    Blockchain myBlockchain;

    myBlockchain.addBlock("Transaction 1");
    myBlockchain.addBlock("Transaction 2");
    myBlockchain.addBlock("Transaction 3");

    myBlockchain.printChain();

    return 0;
}
```

Output:

outputf.in

```
Block #1
Timestamp: Thu Aug 24 20:57:58 2023
Data: Genesis Block
Previous Hash: 0
Hash: 0Genesis Block1692890878hashed

Block #2
Timestamp: Thu Aug 24 20:57:58 2023
Data: Transaction 1
Previous Hash: 0Genesis Block1692890878hashed
Hash: 0Genesis Block1692890878hashedTransaction 11692890878hashed

Block #3
Timestamp: Thu Aug 24 20:57:58 2023
Data: Transaction 2
Previous Hash: 0Genesis Block1692890878hashedTransaction 11692890878hashed
Hash: 0Genesis Block1692890878hashedTransaction 11692890878hashedTransaction 21692890878hashed

Block #4
Timestamp: Thu Aug 24 20:57:58 2023
Data: Transaction 3
Previous Hash: 0Genesis Block1692890878hashedTransaction 11692890878hashedTransaction 21692890878hashed
Hash: 0Genesis Block1692890878hashedTransaction 11692890878hashedTransaction 21692890878hashedTransaction 31692890878hashed
```