

Experiment no: 4

Title: Proof of work (pow) implementation

Aim: Implement proof of work to simulate mining in java

Code:

```
import java.security.MessageDigest;
import java.security.NoSuchAlgorithmException;

public class ProofOfWork {

    public static void main(String[] args) {
        String blockData = "Transaction Data: Alice pays Bob 10 BTC";
        int difficulty = 4;
        mineBlock(blockData, difficulty);
    }

    public static void mineBlock(String data, int difficulty) {
        String target = new String(new char[difficulty]).replace('\0', '0');
        int nonce = 0;

        long startTime = System.currentTimeMillis();

        while (true) {
            String blockDataWithNonce = data + nonce;
            String hash = calculateSHA256(blockDataWithNonce);

            if (hash.startsWith(target)) {
                long endTime = System.currentTimeMillis();
                System.out.println("Block mined! Nonce: " + nonce);
                System.out.println("Hash: " + hash);
            }
        }
    }
}
```

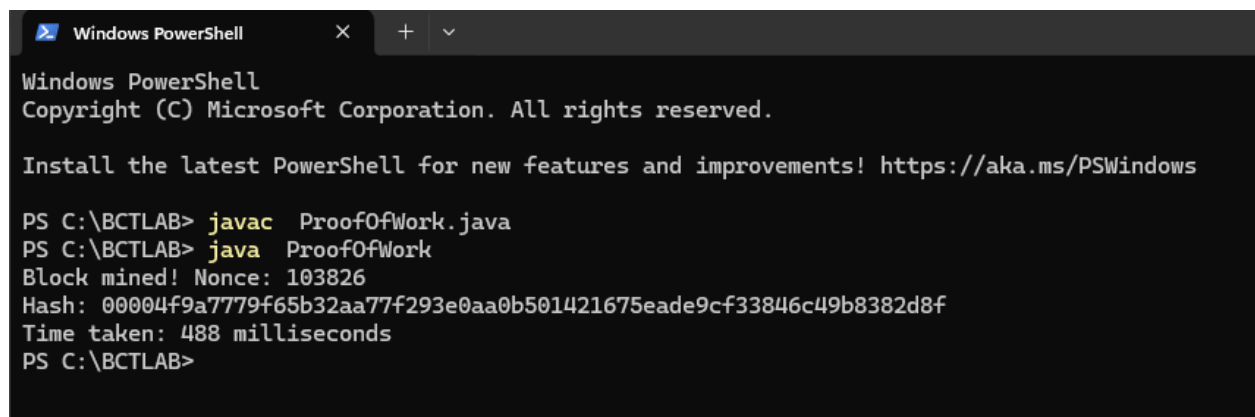
```

        System.out.println("Time taken: " + (endTime - startTime) + " milliseconds");
        break;
    }
    nonce++;
}
}

public static String calculateSHA256(String data) {
    try {
        MessageDigest digest = MessageDigest.getInstance("SHA-256");
        byte[] hashBytes = digest.digest(data.getBytes());
        StringBuilder hexString = new StringBuilder();
        for (byte b : hashBytes) {
            hexString.append(String.format("%02x", b));
        }
        return hexString.toString();
    } catch (NoSuchAlgorithmException e) {
        throw new RuntimeException("SHA-256 algorithm not found", e);
    }
}
}
}

```

Output:



```

Windows PowerShell
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Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\BCTLAB> javac ProofOfWork.java
PS C:\BCTLAB> java ProofOfWork
Block mined! Nonce: 103826
Hash: 00004f9a7779f65b32aa77f293e0aa0b501421675eade9cf33846c49b8382d8f
Time taken: 488 milliseconds
PS C:\BCTLAB>

```