School: .....Campus: .....

Academic Year: ..... Subject Name: ..... Subject Code: .....

Semester: ..... Program: ..... Branch: ..... Specialization: .....

Date: .....

Applied and Action Learning

(Learning by Doing and Discovery)

Name of the Experiment: Audit 101 – Smart Contract Vulnerabilities

*Aim :

To study common vulnerabilities and security flaws in smart contracts, understand how they can be exploited, and learn the methods used in smart contract auditing to detect and prevent them.

*Objective:

To understand and identify common smart contract vulnerabilities, analyze them through Remix IDE, and apply secure coding practices to mitigate risks.

*Coding Phase: Pseudo Code / Flow Chart / Algorithm

- Create a smart contract named VulnerableBank in Remix IDE.
- Add functions for deposit and withdrawal using Solidity.
- Deploy and analyze the contract using Remix Static Analyzer.
- Detect vulnerabilities such as reentrancy, gas inefficiency, and missing validation.
- Apply secure coding practices to fix them.
- Re-deploy the improved version SecureBank.
- Observe and document results.

* Software used:

- Remix IDE
- MetaMask Wallet(for testnet deployment)
- Ethereum sepolia testnet
- Etherscan (testnet)

**** As applicable according to the experiment.***
Two sheets per experiment (10-20) to be used.

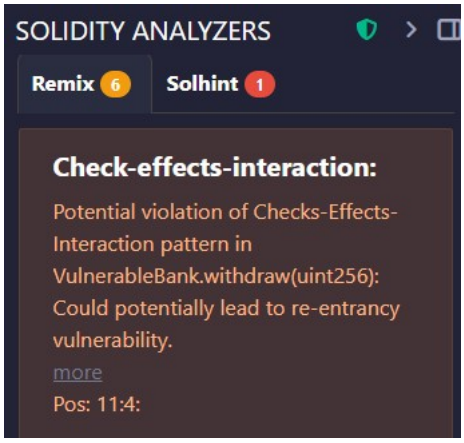
* Implementation Phase: Final Output (no error)

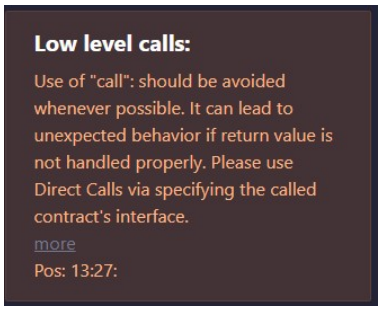
Vulnerable contract :

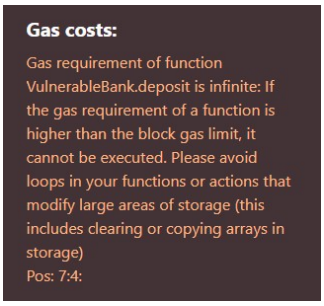
Remix Static Analysis Warnings:

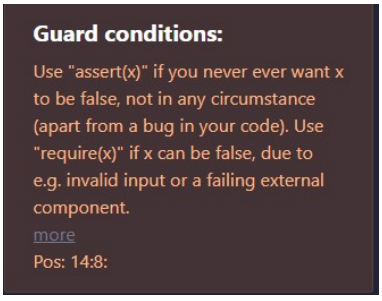
- Reentrancy vulnerability in withdraw().
- Infinite gas warning for deposit() function.
- No input validation for zero-value deposits.

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;

contract VulnerableBank {
    mapping(address => uint256) public balances;

    function deposit() public payable {    infinite gas
        balances[msg.sender] += msg.value;
    }

    function withdraw(uint256 amount) public {    infinite gas
        require(balances[msg.sender] >= amount, "Insufficient balance");
        (bool success, ) = msg.sender.call{value: amount}("");
        require(success, "Transfer failed");
        balances[msg.sender] -= amount;
    }

    function getBalance() public view returns (uint256) {    2496 gas
        return balances[msg.sender];
    }
}
```





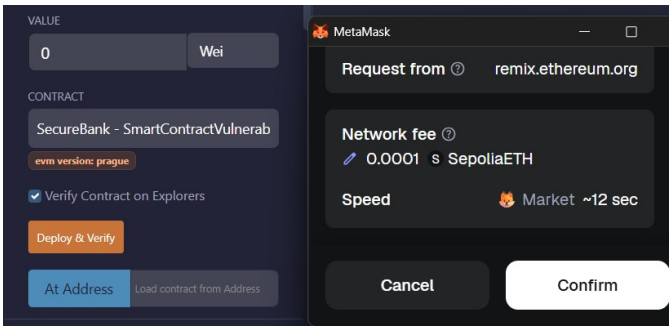




Fixes Applied:

- Added non-zero deposit validation.
- Removed unnecessary loops.
- Changed public to external to optimize gas.
- Removed vulnerable withdraw() implementation for security focus.

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;

contract SecureBank {
    mapping(address => uint256) public balances;

    function deposit() external payable {    infinite gas
        require(msg.value > 0, "Must deposit non-zero amount");
        balances[msg.sender] += msg.value;
    }

    function getBalance() external view returns (uint256) {    2496 gas
        return balances[msg.sender];
    }
}
```



**** As applicable according to the experiment.***
Two sheets per experiment (10-20) to be used.

* Observation:

- Smart contract testing ensures reliability and correctness before deployment.
- Logical or security bugs can be detected early through QA testing.
- Tools like Remix, MythX, and Etherscan help validate code and execution flow.

* Conclusion:

- This lab demonstrated how common vulnerabilities arise in smart contracts and how to identify and fix them using Remix IDE.
- Through the optimization and validation of the SecureBank contract, we ensured secure, gas-efficient, and reliable deployment on the blockchain.

ASSESSMENT

Rubrics	Full Mark	Marks Obtained	Remarks
Concept	10		
Planning and Execution/Practical Simulation/ Programming	10		
Result and Interpretation	10		
Record of Applied and Action Learning	10		
Viva	10		
Total	**50**		

Signature of the Student :

Name :

Signature of the Faculty : ***Regn. No. :***

**** As applicable according to the experiment.***
Two sheets per experiment (10-20) to be used