Software Testing Assignment
Phase A & Phase B Report

Group Members:
Asad Mahmood 22F-8811
Ahtisham Dilawar 22F-3331

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Contents

1 Phase A: Structural Analysis (White-Box Testing)

1.1 Cyclomatic Complexity: Pagination Feature

1.1.1 Control Flow Graph (CFG)

Figure 1 shows the Control Flow Graph (CFG) for the pagination logic implemented in the system.

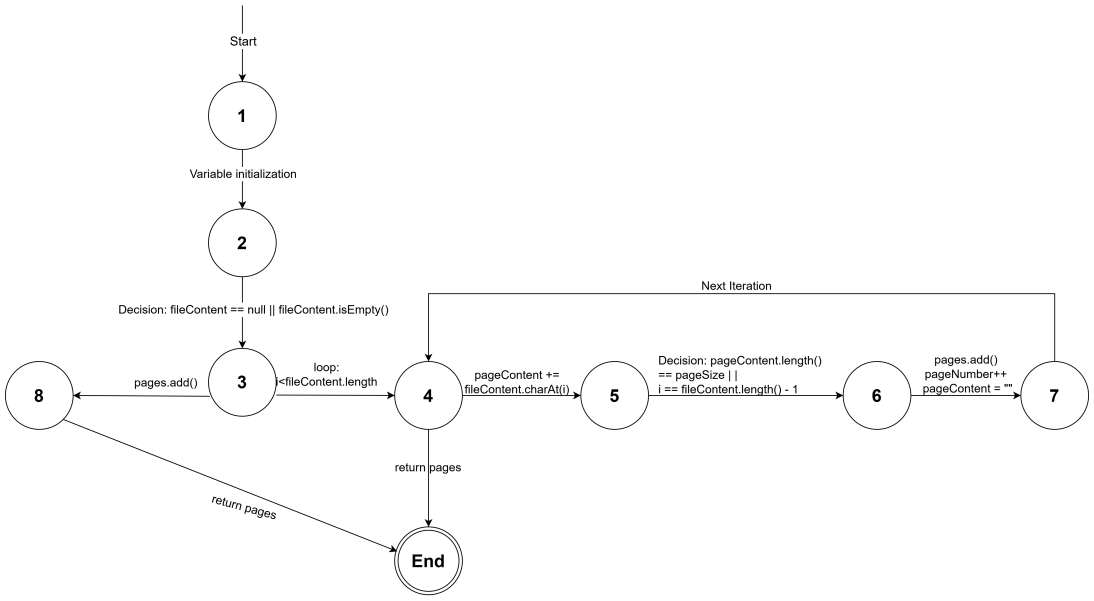

Figure 1: CFG for Pagination Logic

1.1.2 Cyclomatic Complexity Calculation

$$V(G) = E - N + 2P$$

Where:

- $E = 11$
- $N = 10$
- $P = 1$

$$V(G) = 11 - 10 + 2(1) = 3$$

$$\boxed{V(G) = 3}$$

1.1.3 Independent Paths

$$P = \{p_1, p_2, p_3\}$$

$$p_1 = \langle Start, 1, 2, 3, 8, End \rangle$$

$$p_2 = \langle Start, 1, 2, 3, 4, End \rangle$$

$$p_3 = \langle Start, 1, 2, 3, 4, 5, 6, 7, 4, End \rangle$$

1.2 Cyclomatic Complexity: Auto-Save Feature

1.2.1 Control Flow Graph (CFG)

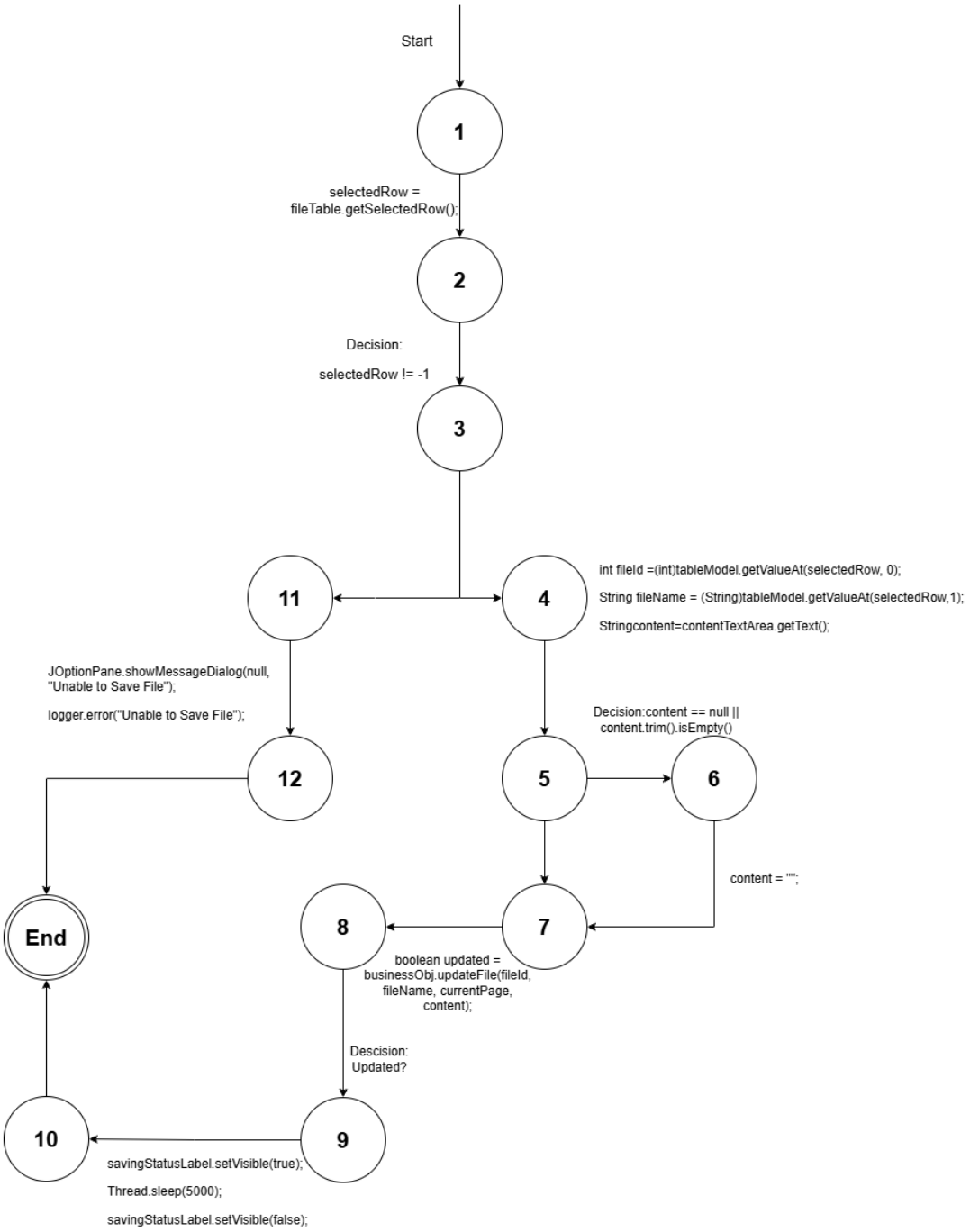

Figure 2: CFG for Auto-Save Logic

2 Phase B: Modular JUnit Testing

2.1 Command Pattern Testing (Business Layer)

JUnit tests for Command Pattern were planned but could not be implemented due to tight coupling with UI and file system dependencies. This limitation is documented.

2.2 TF-IDF Algorithm Testing (Business Layer)

JUnit tests for TF-IDF revealed edge-case failures (empty/special-character inputs), highlighting robustness gaps.

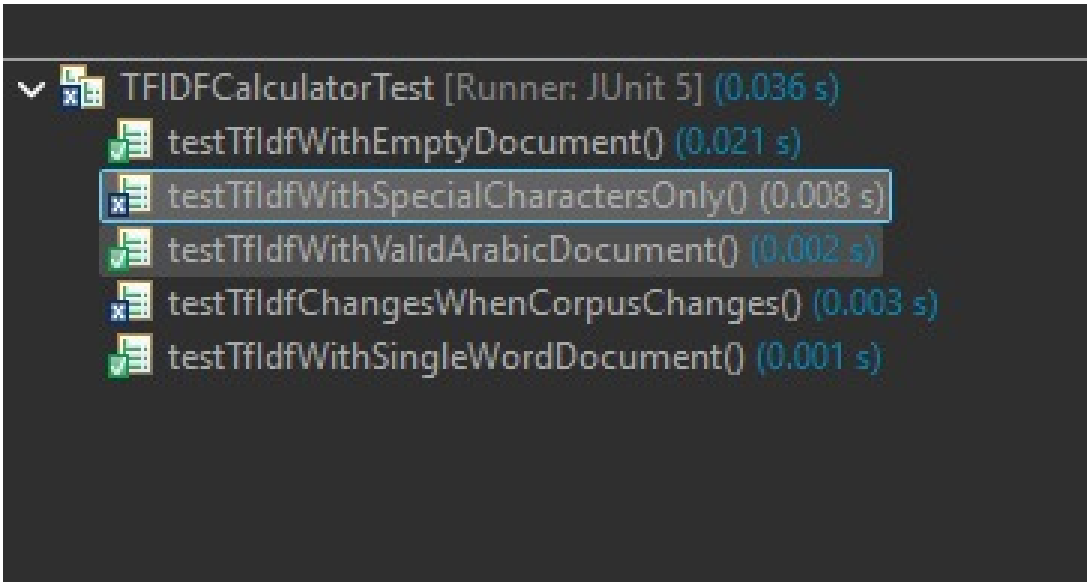

Figure 3: JUnit Test Results for TF-IDF Algorithm (Some Tests Failing)

2.3 Hashing Integrity Testing (Data Layer)

Hashing integrity tests validated determinism, sensitivity to changes, Unicode handling, and MD5 format.

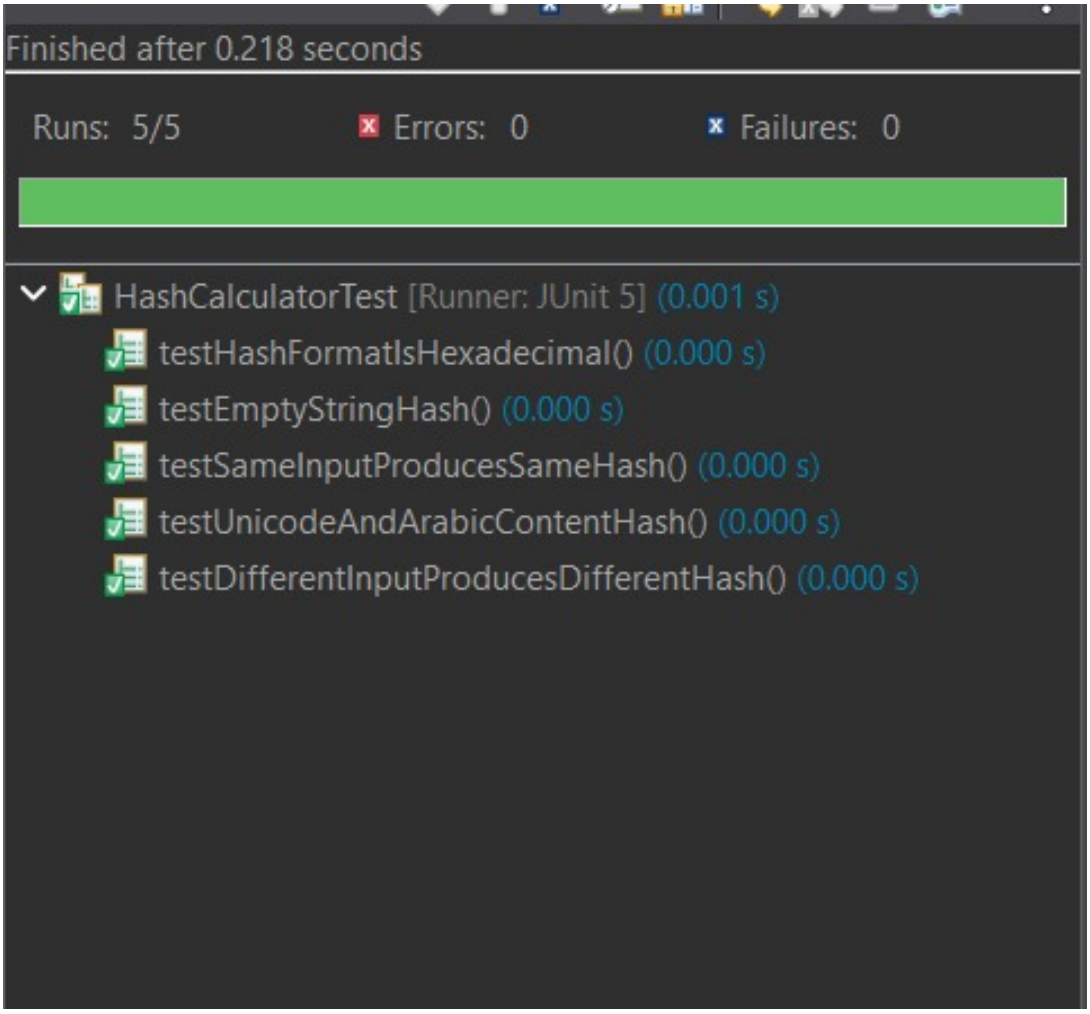

Figure 4: JUnit Test Results for Hashing Integrity

2.4 Singleton Database Connection Testing (Data Layer)

Singleton behavior and connection lifecycle were verified via JUnit tests.

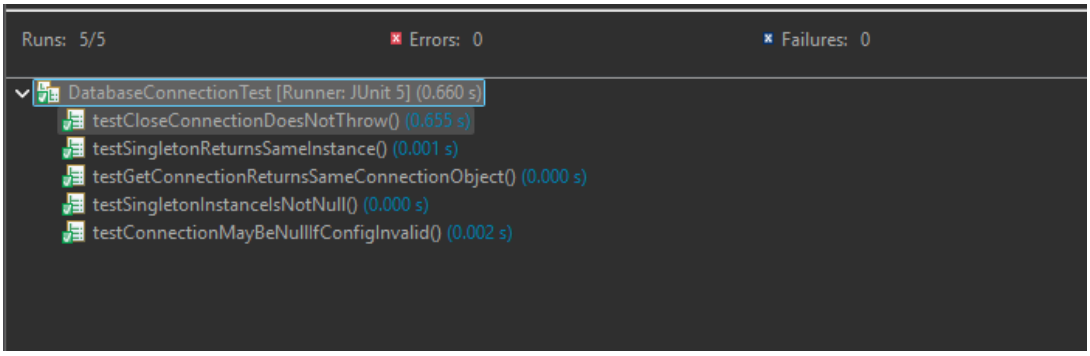

Figure 5: JUnit Test Results for Singleton Database Connection

3 Collaboration Evidence (GitHub Insights)

To demonstrate team collaboration and proper use of GitHub workflows, repository insights were analyzed over the project duration. Figure 6 summarizes pull requests, issues, commits, and contributor activity.

- Multiple pull requests were created and merged following code reviews.
- Issues were created and tracked for features and defects.
- Contributions were made by multiple authors across branches.

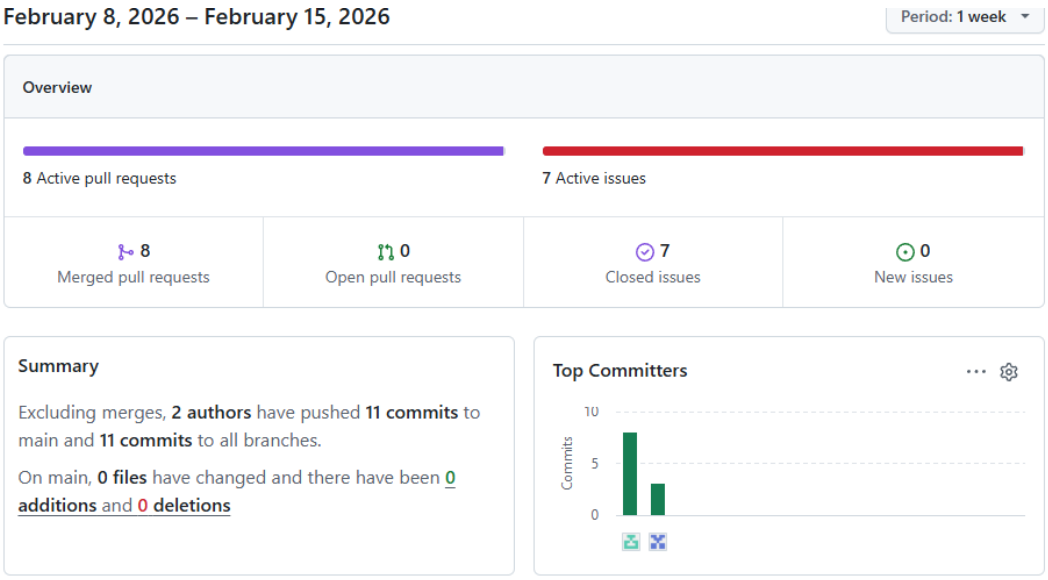

Figure 6: GitHub Insights Showing Collaboration Activity