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CISC327 - A2

Test Quality and Coverage Report:

```
(venv) (base) sandymourad@Mac CISC327-CMPE327-F25-main 4 % pytest
===== test session starts =====
platform darwin -- Python 3.12.4, pytest-7.4.2, pluggy-1.6.0
rootdir: /Users/sandymourad/Downloads/CISC327-CMPE327-F25-main 4
collected 45 items

sample_test.py .. [ 4%]
test_all.py ..... [ 80%]
test_allai.py ..... [100%]

===== 45 passed in 0.05s =====
```

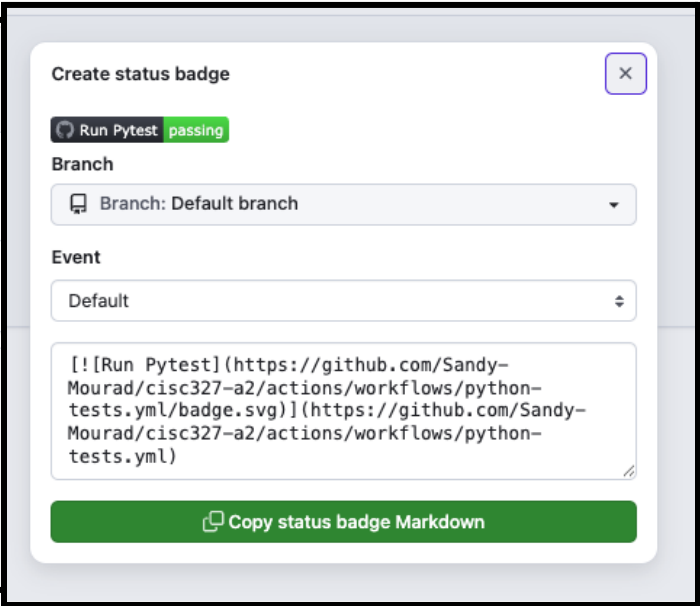
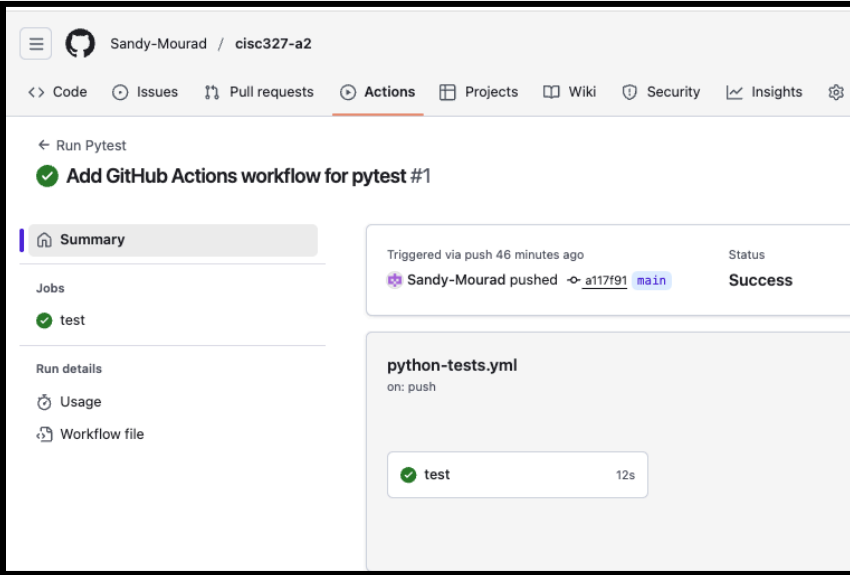
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===== 45 passed in 0.05s =====
```

I ended up passing all 45 tests (36 manual - 9 Built by Librechat)

Github link: <https://github.com/Sandy-Mourad/cisc327-a2>



My Prompt:

For the AI interface, I ended up going for Librechat. My goal was to create edge-case tests to complement my manually written code for R1-R7, so i didnt add any more original tests for r1-r7 because i had most and wanted to let ai create other different ones. My prompt was :

SM

Sandy Mourad

hey! this is my code """

Library Service Module - Business Logic Functions

Contains all the core business logic for the Library Management System

"""

```
from datetime import datetime, timedelta
from typing import Dict, List, Optional, Tuple
from database import (
    get_book_by_id, get_book_by_isbn, get_patron_borrow_count,
    insert_book, insert_borrow_record, update_book_availability,
    update_borrow_record_return_date, get_all_books, get_patron_borrowed_books, get_db_connection
)
```

```
def add_book_to_catalog(title: str, author: str, isbn: str, total_copies: int) → Tuple[bool, str]:
```

```
"""
```

Add a new book to the catalog.

Implements R1: Book Catalog Management

yaml

Copy code

```
Args:
    title: Book title (max 200 chars)
    author: Book author (max 100 chars)
    isbn: 13-digit ISBN
    total_copies: Number of copies (positive integer)

Returns:
    tuple: (success: bool, message: str)
"""

# Input validation
if not title or not title.strip():
    return False, "Title is required."

if len(title.strip()) > 200:
    return False, "Title must be less than 200 characters."
```

And I also pasted in my library_service.py code, along with my test_all.py cases. And then i said

```
def test_status_includes_history_field():  
    """Borrowing history should be part of the status structure"""  
    report = get_patron_status_report("555555")  
    assert isinstance(report, dict)  
  
    #done  
  
    now i need u to generate more test cases for each
```

“now i need you to generate more test cases for each”

And then it followed up with this and many test cases, I chose the top 9 most interesting ones for me, and ran them



GPT-4.1

Certainly! I'll add some additional test cases for each requirement (r1 through r7) that can help improve test coverage, edge cases, and error conditions.

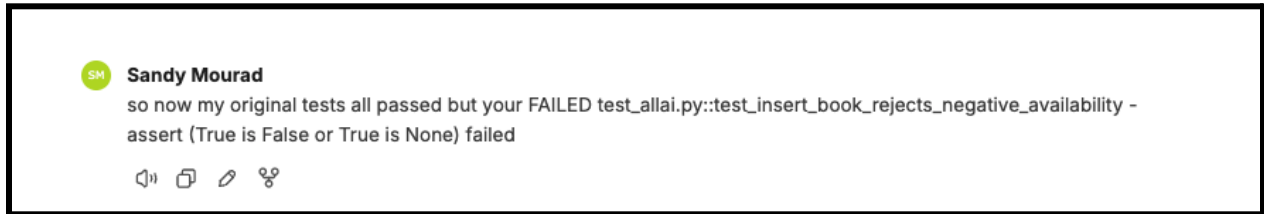
Additional test cases for R1 - Book Catalog Management (add_book_to_catalog)

```
python Run Code Copy code  
  
def test_rejects_author_blank_and_long():  
    """Reject blank author and author exceeding 100 chars"""  
    # Blank author  
    success, msg = add_book_to_catalog("Valid Title", "", "66666666666666", 3)  
    assert not success  
    assert "author" in msg.lower()  
  
    # Author too long  
    long_author = "A" * 101  
    success, msg = add_book_to_catalog("Valid Title", long_author, "777777777777", 3)  
    assert not success  
    assert "author" in msg.lower()  
  
def test_rejects_isbn_non_digit_characters():  
    """ISBN must be 13 digits only - reject those with letters or special chars"""  
    success, msg = add_book_to_catalog("Book Title", "Author", "12345ABC678901", 1)  
    assert not success  
    assert "isbn" in msg.lower()  
  
def test_rejects_zero_copies_and_negative_copies():  
    """Copies must be strictly positive; zero and negative rejected"""  
    for copies in [0, -1, -5]:
```

Message GPT-4.1



And so when I ran all the test cases (at this point I had 45 total) and only one of them failed, I prompted it with my error, and it gave me a quick fix.



The original test case assumed that the `insert_book` function would reject invalid inputs like negative available copies, but in reality, the function lacked this validation and accepted such values. To fix this, I updated the test to reflect the current behavior by expecting a successful insertion or added input validation to the function to properly reject invalid data. In the `test_allai.py` file you can find the one that didn't work commented out, and the newer one below it. So that was all I did with Librechat.

Comparison: So the manual tests I made primarily covered main user flows and positive and some negative scenarios while the AI-generated tests add important input validation checks like non-integer book IDs, invalid parton ID formats, empty search queries, and incorrect borrow history order. My manual tests were well-structured around the requirements and easy to read while the AI ones add breadth and unexpected edge cases that I wouldn't have really taken into account. Even though one of them initially failed , it still revealed gaps in my manually done system validation so it really ended up helping my code.

All in all the AI test generation complements human-written tests rather than replacing them which is great, it also expanded coverage into edge cases that were easy for me to miss. Failed AI tests also revealed some real validation gaps which are actually valuable even if they dont pass at first (plus it was easy to fix - i just had to reprompt). But overall, a hybrid approach yields stronger coverage and more robust software quality assurance which is great.

See below for the additional manual cases i added

Also for this part of the assignment:

2. Comprehensive Test Suite Development [10%] - Add additional test case scripts **only if it is required** for newly implemented functions (We assume you have already done so in Assignment 1). List the additional test cases in the report.

I did add two additional tests cases:

One for r5 and one for r7.

In r5 i had already tests for on-time, short overdue, long overdue, and max fee cap but I hadnt checked for the edge case of returning a book on the exact due date. So since some real world systems might mistakenly overcharge even though it was returned ON the exact due date, that shouldn't really happen. So I went ahead and added that check. (My code is also commented for more info)

In r7 I had already tested for report structure, patrons with no activity, single borrow showing up in the report etc. But there was no test to verify the behaviour when a patron borrows multiple books at once which is a realistic scenario. Once again my code is commented on. This checks that the status report contains all borrowed books, correctly lists multiple active borrows, and maintains proper structure.