Memory Management Assessment

Group Project (1-3 students)

**Objective:** This project requires you to complete a memory allocation simulator framework in Python. You will need to implement a memory allocation algorithm which will be tested and evaluated by the simulator. The simulator contains five test cases, each consisting of a set of mock process memory requests. For each test case, the evaluation will consider how many process memory requests your algorithm can successfully allocate. Each test case carries a maximum of 10 points, with 1 point deducted for every unsuccessful allocation until no points remain.

The framework includes the files:

* **AllocationAPI.py** defines the basic classes to simulate system process and memory allocator APIs.
* **TaskDefine.py** defines the test cases.
* **MemoryManagement.py** contains the memory allocation class that you should complete.
* **Tester.py** is the testing code that you should run to test your algorithm and obtain the result. This can use tables to show the allocation process for each testing case.

If you find an error in the code please let me know and I will update the code.

**Question 0: Understanding the Framework**

Understand the provided memory allocation simulator framework in Python (you don't need to write any words for this question).

**Question 1: Implementing the Algorithm (50 points for the 5 test cases)**

Implement a memory allocation algorithm within the provided framework. You should only revise/complete the file **MemoryManagement.py**. Don't revise other files. After completing your implementation, run **Tester.py** to see the results.

Please report the results, for each test case, including

* the error numbers
* the scores
* and the code of the allocate() function of the class MemoryManager.

**Question 2: Designing the Algorithm (20 points)**

Explains the design of your memory allocation algorithm. Your essay should cover the following topics:

* The overall design and structure of your algorithm
* How you implemented your design in Python
* Any challenges or obstacles you encountered and how you overcame them

**Question 3: Discussion of Internal and External Fragmentation (10 points)**

Explain whether this question is about internal fragmentation or external fragmentation, and discuss the difference between internal fragmentation and external fragmentation.

**Question 4: Discussion of External Fragmentation (20 points + Extra 10 points. You can get up to 10 extra points from this question, but your total score will not exceed 100 points.)**

Based on the testing results and your implementation, discuss which aspects of your implementation contributed to external fragmentation? How would your algorithm or system design reduce the external fragmentation (disregarding moving already allocated memory blocks)? This question is open-ended, and creative and thoughtful responses are encouraged.

The assignment will be graded based on correctness and efficiency of the algorithm, thoroughness of the explanation, and insightfulness of the fragmentation discussion. Good luck!