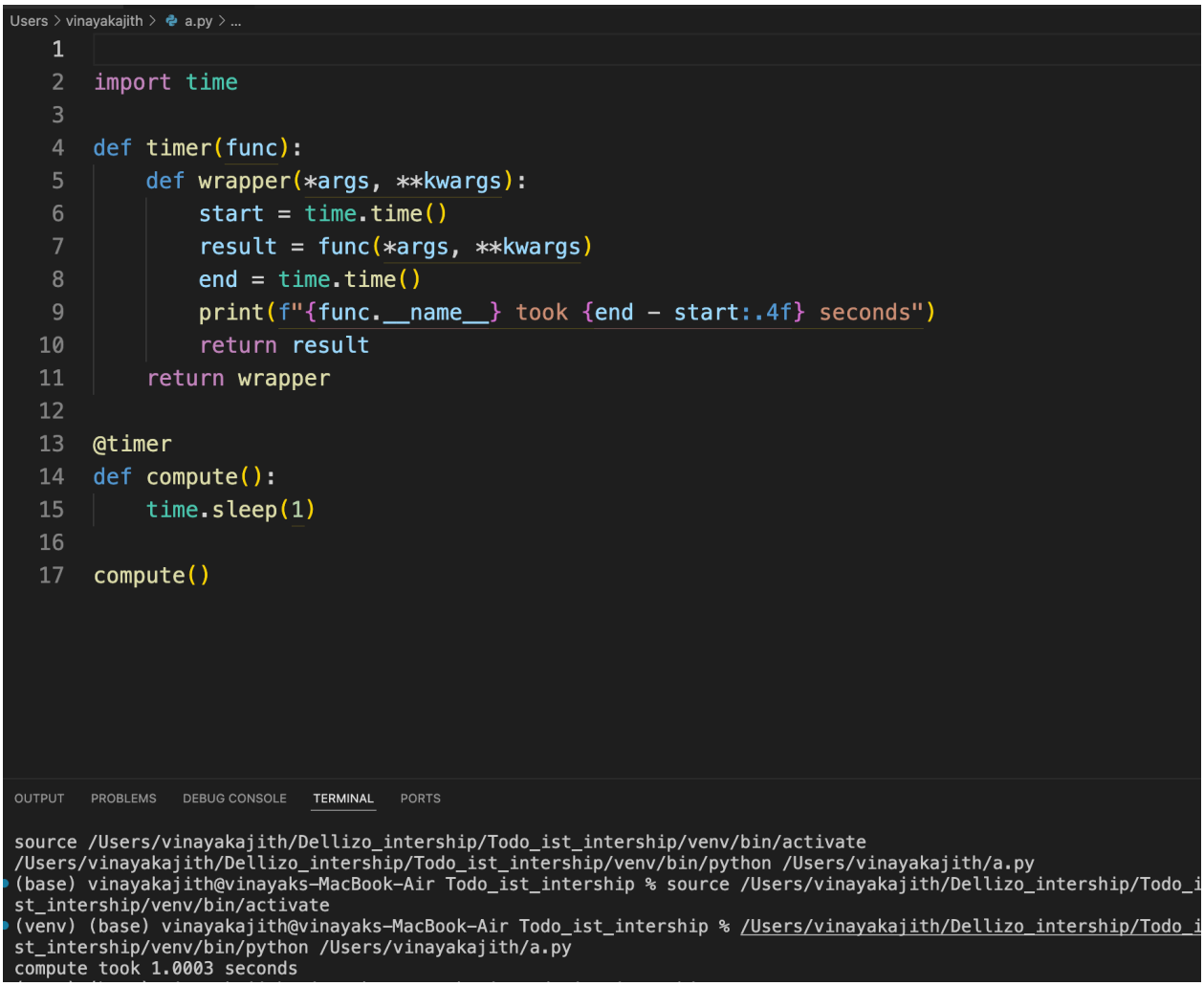
Technical Questions — Python Internship Assessment

1. What are Python decorators and give a use-case? (5 Marks)

Python decorators are functions that modify the behavior of other functions or methods without changing their original code. They wrap another function to extend or alter its behavior in a clean and reusable way

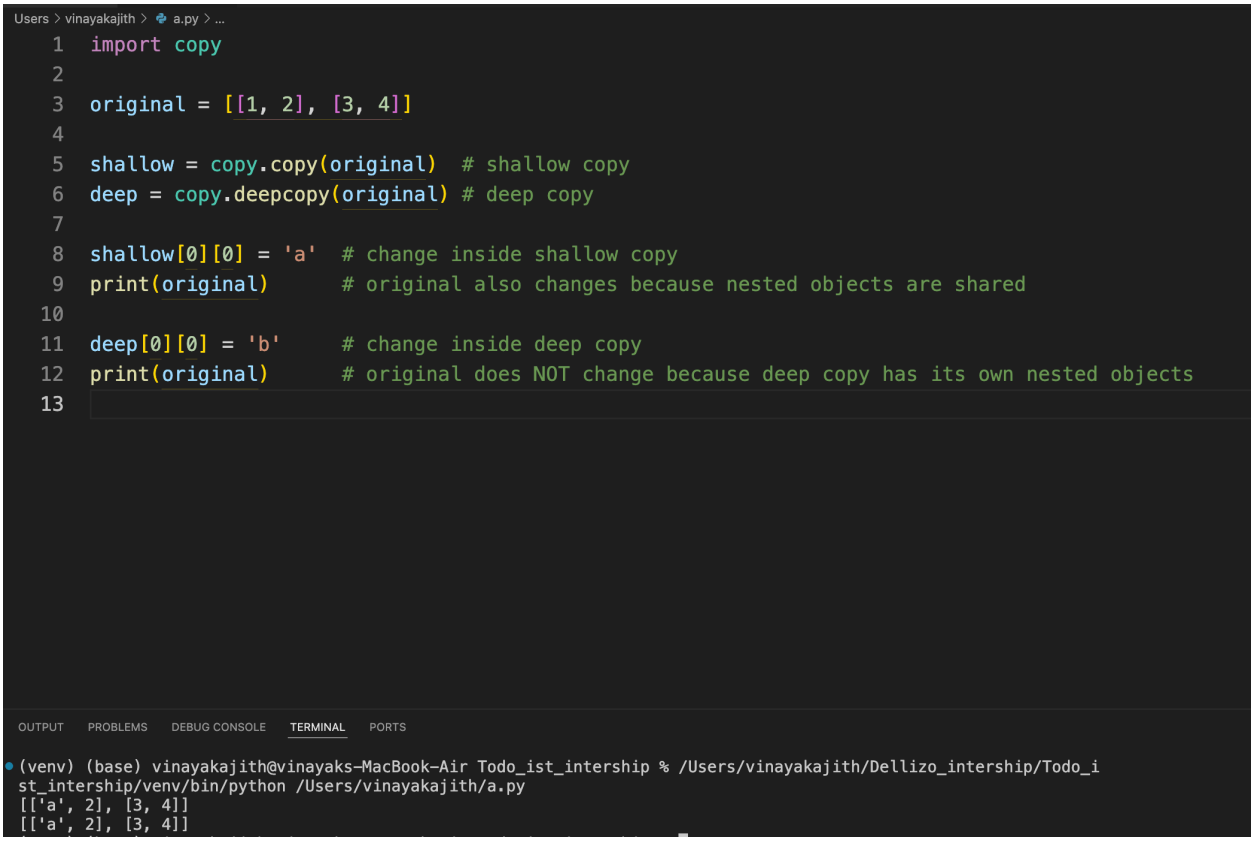


2. Explain the difference between deepcopy and copy in Python. (5 Marks)

Shallow copy means copying the object but not the things inside it. So if the object has other objects inside (like lists inside a list), both the original and the copy still share those inner objects. If you change something inside those nested objects, both will see the change.

Deep copy means copying the object and everything inside it, recursively. So the copy is fully independent from the original. Changing anything in the copy won't affect the original at all.

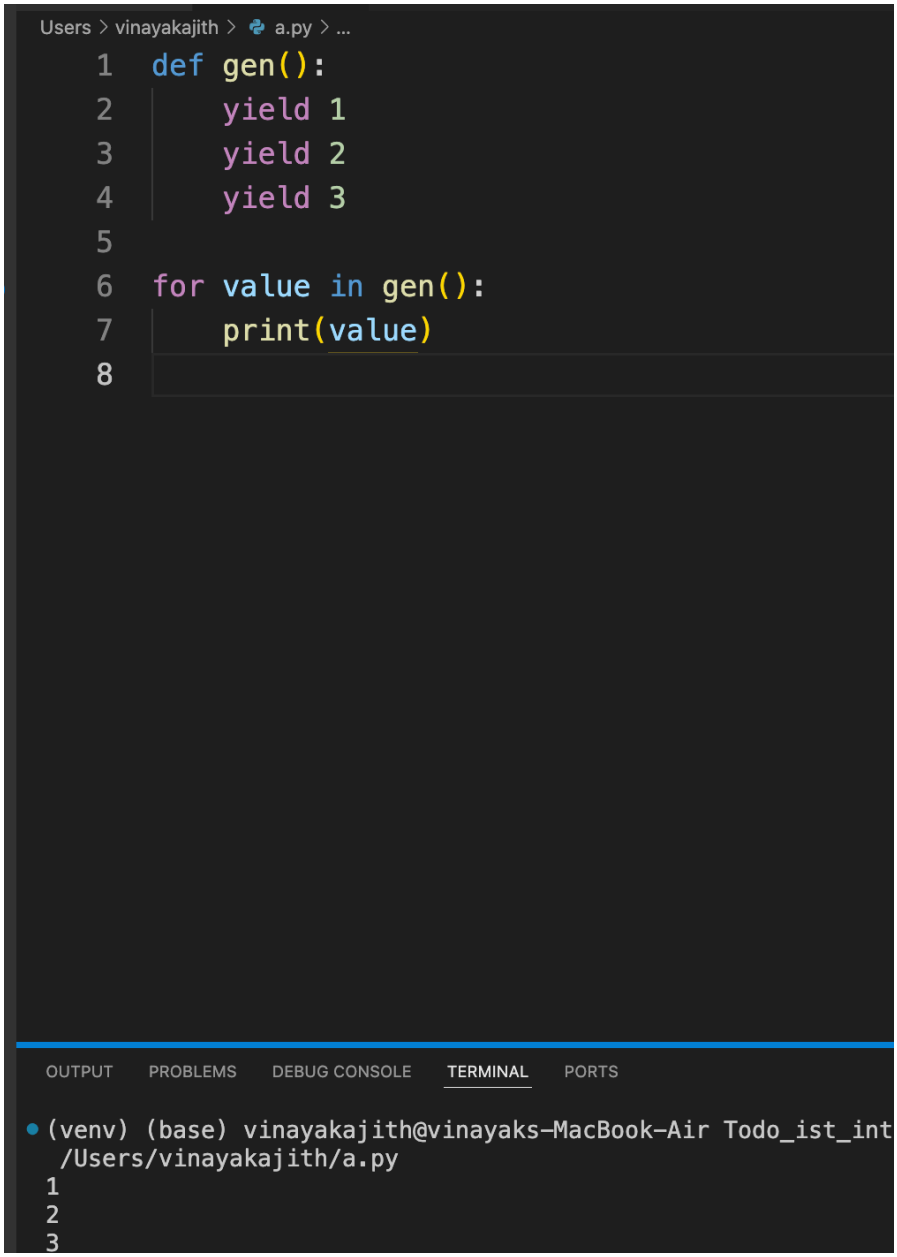
Example:



3. What is a generator? How is it different from a list? (5 Marks)

A generator is a special kind of iterator that yields items one by one, generating values on the fly and using memory efficiently.
In contrast, a list stores all values in memory at once.

Generators are useful for large datasets or streams because they don't require storing the entire sequence in memory.



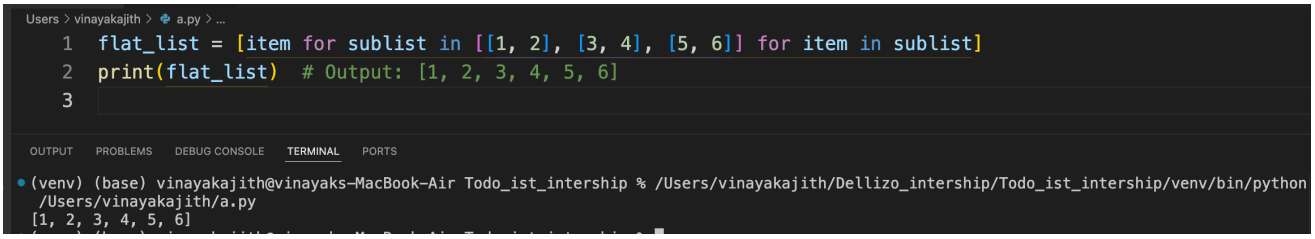
4. What are Python's GIL and its implications for multithreading? (5 Marks)

The Global Interpreter Lock (GIL) is a mutex in the CPython interpreter that allows only one thread to execute Python bytecode at a time.
This means:

- CPU-bound Python threads do **not** run in true parallelism, limiting multithreaded performance on multi-core processors.
- I/O-bound tasks (like network or file operations) can still benefit from multithreading.
- For CPU-bound parallelism, multiprocessing or external libraries (e.g., NumPy) are used.

5. Write a list comprehension to flatten a 2D list [[1, 2], [3, 4], [5, 6]] into [1, 2, 3, 4, 5, 6]. (2 Marks)

List comprehension is a quick way to create a new list by doing something to each item in another list. It's like a shortcut instead of writing a loop.

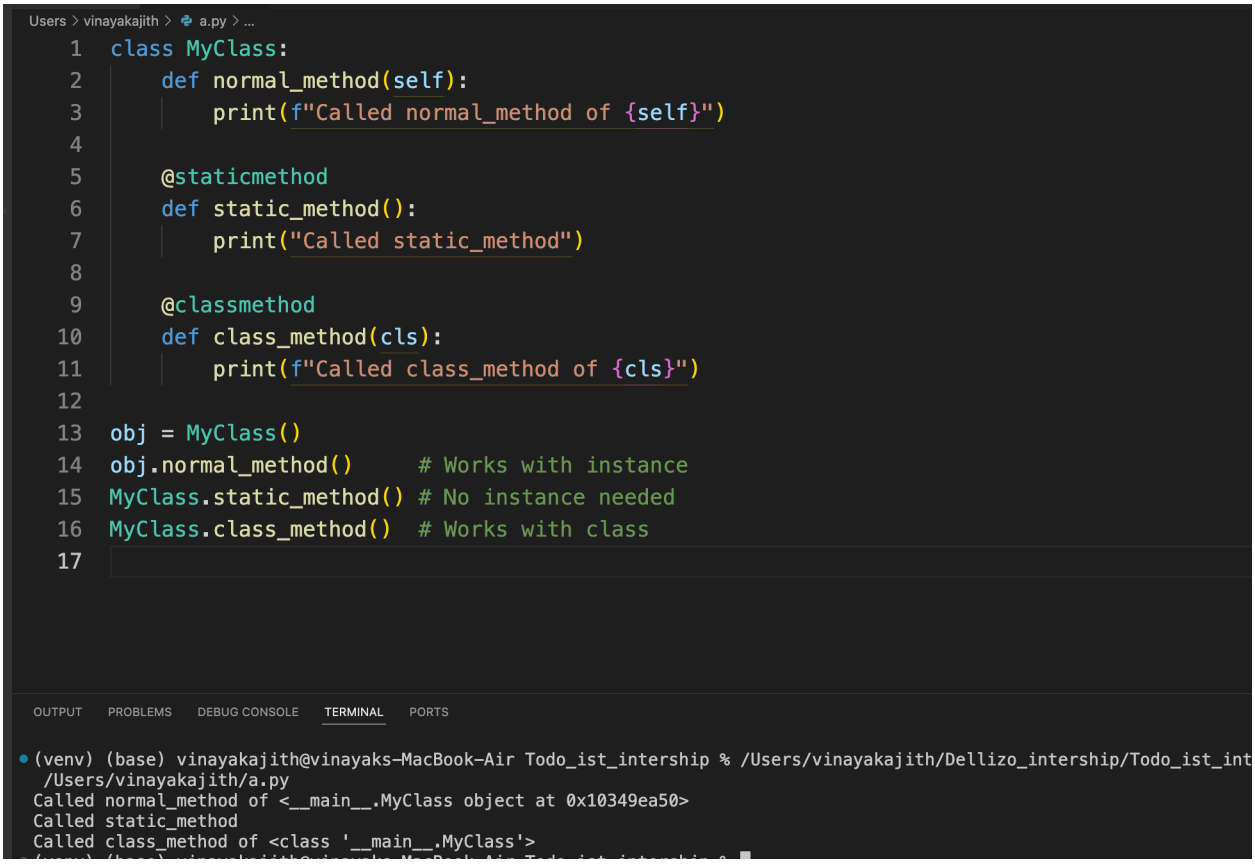


6. What is the difference between @staticmethod, @classmethod, and normal methods? (4 Marks)

Normal methods: receive the instance (self) as the first argument. They can access and modify instance and class attributes.

@staticmethod: does not receive self or cls. Acts like a regular function inside the class namespace. It cannot access instance or class data unless explicitly passed.

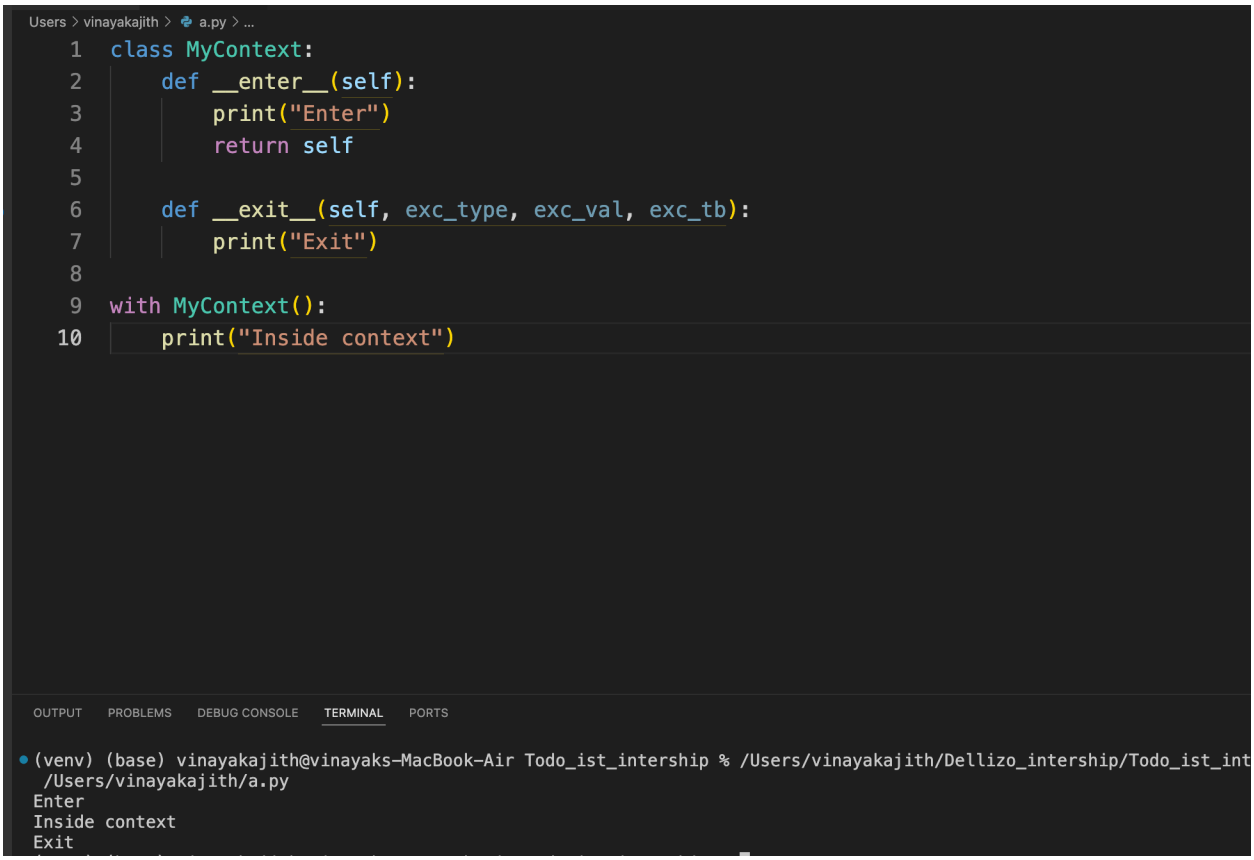
@classmethod: receives the class (cls) as the first argument. Can access and modify class state, but not instance state.



7. Explain the concept of context managers and write a custom one. (4 Marks)

Answer:
Context managers provide a way to allocate and release resources precisely when you want, typically using the withstatement.
They handle setup and cleanup actions automatically.

Example custom context manager:



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