Name of the candidate: _____

(1.2 points) **Question 1**
Explain what unit testing is and why it is important in software development.
Which tests would you provide for a function computing the maximum value in an array?

Answer

(1.2 points) **Question 2**
Discuss the concept of memory management in C++.
How do smart pointers improve memory management compared to raw pointers? Provide examples.

Answer

Name of the candidate: _____

(1.2 points) **Question 3**
Explain the concept of inheritance in object-oriented programming. How does it differ from composition?
Provide a C++ example illustrating both concepts.

Answer

(1.2 points) **Question 4**
Explain the concept of *exception safety* in C++.
Provide a C++ example where exception safety is essential.

Answer

Name of the candidate: _____

(1.2 points) **Question 5**
What is the difference among *function pointers*, *functors*, and *lambda functions* in C++ and how can they be used in practice?
Write C++ examples demonstrating their use in a sorting algorithm.

Answer

(1.2 points) **Question 6**
Given the following Python function that calculates the Fibonacci sequence using recursion, optimize it to use an iterative approach. Discuss the advantages and disadvantages of this new approach compared to the original implementation.

```
def fibonacci(n):
    if n <= 1:
      return n
    else:
      return fibonacci(n - 1) + fibonacci(n - 2)
```

Answer

Name of the candidate: _____

(1.2 points) **Question 7**
Describe how the `__call__` method can be used to turn a Python class into a callable object.
Provide an example where this feature is useful.

Answer

(1.2 points) **Question 8**
In Python, explain the *GIL (Global Interpreter Lock)* and how it impacts multi-threaded applications.
What are some strategies to work around the limitations imposed by the GIL?

Answer

Name of the candidate: _____

(1.2 points) **Question 9**
Explain the concept of decorators in Python.
Provide an example of a decorator that modifies the behavior of a function.

Answer

(1.2 points) **Question 10**
Explain the difference between defining *functions* and *methods* in pybind11.
Provide an example where a C++ class with methods is exposed to Python, and show how you can call those methods from Python.

Answer