Advanced Programming – Exam 16 Jan 2026 - Part 1

Name:

Question 1 (1.2 points)

Explain the concept of RAII (Resource Acquisition Is Initialization) in C++. How does it help prevent resource leaks? Provide an example for a `Vector` class that uses a raw pointer to store an array.

Question 2 (1.2 points)

What is move semantics in C++ and when should it be used? For the `Vector` class in Question 1, write a move constructor and a move assignment operator.

Name:

Question 3 (1.2 points)

Explain the difference between `std::vector` and `std::array` in C++. When would you choose one over the other?

Question 4 (1.2 points)

What is operator overloading in C++? Write a `Complex` class that overloads the `+` and `<<` operators for complex number arithmetic and output.

Name:

Question 5 (1.2 points)

Explain the concept of virtual destructors in C++. Why are they important in inheritance hierarchies? Provide an example demonstrating the consequences of not using a virtual destructor.

Question 6 (1.2 points)

What is the difference between mutable and immutable objects in Python? Provide examples of each type and explain how this affects function arguments.

Name:

Question 7 (1.2 points)

Explain the concept of list comprehensions in Python. Write a comprehension that creates a list of even numbers from 0 to 100 (i.e., `[0, 2, 4, ..., 98, 100]`).

Question 8 (1.2 points)

What are generators in Python and how do they differ from regular functions? Write a generator function that yields the squares of numbers from 0 to `n`.

Name:

Question 9 (1.2 points)

Explain Python's duck typing philosophy. Write an example that demonstrates how duck typing enables polymorphic behavior without explicit inheritance.

Question 10 (1.2 points)

In pybind11, how do you handle default arguments and keyword arguments when binding C++ functions to Python? Provide an example.