



Institut of Numerical Mathematics

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Quiz 5

## High Performance Computing I (WS 2016/2017)

Deadline: 5 December 2016, 2pm

### Notice:

Please type your responses in a simple text file named "quiz05.txt" and submit it on our server *thales* using the following command:

```
thales$ submit hpc quiz05 quiz05.txt
```

### Question 1

In C++, lambda expressions are internally substituted by temporary objects of a compiler-generated anonymous class. Rewrite following construct by adding a helper class and use this to avoid the lambda expression:

```
GeMatrix<double> A(3, 7, StorageOrder::ColMajor);  
// ...  
{  
    double sum = 0;  
    applyGeMatrix(A, [&sum]  
        (double Aij, std::size_t i, std::size_t j) {  
        sum += Aij;  
        });  
    fmt::printf("sum_of_all_elements_of_A:_%10.2lf\n", sum);  
}
```

### Question 2

Simplify following construct by using a lambda expression:

```
template<typename T, typename Index = std::size_t>  
struct TwoValues {  
    T val1;
```

```

T val2;

TwoValues(T val1, T val2) : val1(val1), val2(val2) {
}
T operator()(Index i, Index j) const {
    return (i + j) % 2 == 0? val1: val2;
}
};

int main() {
    using namespace matvec;
    GeMatrix<double> A(3, 7, StorageOrder::ColMajor);
    initGeMatrix(A, TwoValues<double>(1, 2));
    fmt::printf("A:\n");
    print_matrix(A);
}

```

### Question 3

What is the meaning of the **mutable** keyword in a lambda expression and when is it necessary?