

## Advanced Programming (A.Y. 2014-2015)

M.Sc. Engineering in Computer Science – Sapienza University of Rome

September 17, 2015 – Duration 2h 00'

- **Be concise and right to the point.** What you write should be understandable by a colleague of yours who just enrolled the M.Sc. in Engineering in CS.
- **Parts A and B MUST be written on separate sheets of paper.**
- **Each sheet should have your name written on it – Good luck!**

Last: .....	First: .....	Matr.: .....
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### Part A

#### Question A1 (SOAP)

Describe (i) the concept of SOAP Web service and its technological stack, by focusing on the details of the (ii) SOAP protocol, of the (iii) WSDL for describing interface, and (iv) illustrating the development method to be followed and tools' architecture to be used by a designer/programmer when implementing a WS-based distributed system

#### Question A2 (Development tools and methods)

Describe the concept and ideas of *version control*, and how SVN works. Explain how it can be integrated in a cooperative and distributed software development process.

### Part B

#### Question B1 (MapReduce)

Consider the following MapReduce program that sums all numbers given as values in the input:

- `map(key, value): emit(0,value)`
- `reduce(key, value list): emit(0,sum of numbers in value list)`

Assume the program is executed on a large collection of files containing 10 billion numbers distributed over a large computing cluster. For the given program:

1. What is the maximum number of values a reduce function must process?
2. What good would one get by using a combiner, if this is possible at all?
3. What good would one get by using a custom partitioner, if this is possible at all?
4. Is the proposed solution good?
5. Can you propose a better program for this job?

#### Question B2 (C++)

Consider the following C++ program:

```
int main() {
    double x = 10, y = 20;
    myswap<double>(x,y);
    cout << x << " " << y << endl;
    return 0;
}
```

How would you write function `myswap` so that the output is: 20 10?