**University of Malta**

# Data Structures and Algorithms
# Course Assignment 2014-2015
**Department of Intelligent Computer Systems.**
**University of Malta.**
**Dr. John Abela**
**Email: jabel@cs.um.edu.mt**

**(Attempt ALL questions)**

1. Write and implement a function that accepts a positive integer and outputs a representation of the same integer as a string in Roman numerals format. The range of input should be from 1 to 1024. (Greedy algorithm?)

2. Write a program that uses an ADT Stack to evaluate arithmetic expressions in RPN format. The contents of the stack should be displayed on the screen during evaluation. The allowed arithmetic operators are +, -, x, and /.

3. Write a Boolean function that checks if a number is **prime**. Alternatively, implement the Sieve of Eratosthenes algorithm. Explain any optimizations made.

4. Write a program that fills an integer array of size 16384 with random integers and then sorts the array using an optimized Shell sorting algorithm.

5. Write a program that finds an approximation to the **square root** of a given number **n** using an iterative numerical method such as *Newton's Method*.

6. Write a program that multiplies two random real-valued 16 X 16 matrices. Use two 2-dimensional arrays to store the matrices and another similar array to store the result.

7. Write a **recursive** function that finds that largest number in a given list of integers.

8. Write a function that computes **cosine** or **sine** by taking the first **n** terms of the appropriate series expansion.

9. Write a program that checks if a given input string is a *palindrome.*

   ***Deadline is Friday 29th May at Noon.***
   ***Do not forget the Statement of Completion and the Plagiarism Declaration Form.***