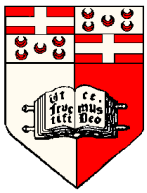
University of Malta



Data Structures and Algorithms
Course Assignment 2015-2016.

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***. Also 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 the *Newton-Raphson Method*.
6. Write a program that multiplies two random real-valued 32 X 32 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 the 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 function that returns the sum of the ***n*** numbers of the Fibonacci sequence (Wikipedia).

Deadline is Friday 27th May at Noon. Do not forget the Statement of Completion and the Plagiarism Declaration Form. Submit assignment to the secretary of your respective department.
CDs and DVDs for code and binaries – no pendrives please.