University of Malta

Data Structures and Algorithms
Course Assignment 2017-2018.

Department of Computer Information Systems.
University of Malta.
Dr John Abela
Email: john.abela@um.edu.mt

1. Write a program that, given a list of integers, finds all 2-pairs of integers that have the same product. A 2-pair is 2 distinct pairs of integers ((*a*,*b*),(*c*,*d*)) where *a* X *b* = *c* X *d* and $a \neq b \neq c \neq d$. The range of integers in the list should be from 1 to 1024.
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 accepts an input a sequence of integers (one by one) and then incrementally builds a Binary Search Tree (BST). There is no need to balance the BST.
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, given an array of integers, finds all integers in the array that are repeated more than once. Try to find the fastest and most memory-efficient way of doing this.
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 first ***n*** numbers of the Fibonacci sequence (Wikipedia).

Deadline is Friday 25th May, 2018 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. You must also upload the assignment, as a single Word or PDF file to Turnitin.