**ENEL101**

**Problem set 5**

**M File Programming**

**Important Notes:**

* This assignment is about writing user defined functions. The questions are based on content from chapters 6 and 7 of the textbook “Matlab, An introduction with applications”.
* Complete this assignment by filling in the template file, assign5.m, which already has the function templates done for you.
* Before you submit your script file, make sure there are no syntax errors.
* The functions will be tested by the auto-tester using randomly generated data.
* Do NOT use ‘clear’ OR ‘clear all’ anywhere in your code.

**Q1.** Given *n*=5, use loops to create a 3 x *n* matrix in which the value of each element is its row number to the power of its column number divided by the sum of its row number and column number e.g. answer(2,3)=2^3/(2+3)

**Q2.**  Fibonacci numbers are the numbers in a sequence in which the first two elements are 1 and 1, and the value of each subsequent element is the sum of the previous two elements as . The reciprocal Fibonacci constant is

where is the th Finonacci number. Given *n*=30, write code to put the results of into a row vector i.e. we are using instead of infinity for each element of the vector.

**Q3.** Write a function that uses the **switch – case** statement (refer to pg.189-192 in the textbook). The function takes a vector of strings in a structure (see assign5.m to see how this is done) and a number as input. Each string is the case condition which specifies the type of operation to be performed on ‘*x*’. The two cases for mathematical operations are ‘invert’ and ‘root2’. The function produces a numeric output for a given numeric value of and the condition . If is anything other than ‘invert’ or ‘root2’, the function sets the output equal to . Place the results in a row vector corresponding to operations as listed in the structure i.e. for the list of operations ‘invert’,’root2’,’none’ and x=0.5 the answer will be [2.0000 0.7071 0].

**Q4.** The Pythagorean theorem states that Given find all integer solutions for and place them as rows in a matrix e.g. the first row of the matrix will be

Use an outer loop based on and an inner loop based on .

**Q5.** A series LR circuit has a ratio of the magnitude of the voltages of

Given a measured voltage ratio, the inductance, and the resistance as input arguments, write a function that outputs the frequency in rad/s.

**Q6.** The Taylor’s series expansion for about is given by:

where is in radians. If is the th term of the series, the sum of the terms is (note that 1 is the zeroeth term). Write a function that calculates an answer, which stops adding terms when the error If the input angle is less than or greater than , first put it between and . Output a row vector with the answer and the number of terms it took to get it (not including the 1 term) i.e. .

**Q7.** Write a function that finds the fifth root of input P using Newton’s method, applying the recursive formula

For the first value use Continue with the recursive formula until the estimated relative error where

The function must output a 1x2 vector, with the first element being the answer (the fifth root) and the second element being the number of iterations that were needed.

**Q8**. Given a point and function approximate the function’s derivative at using the four-point difference formula

using must be a small number relative to The function must output a 1x3 vector, the first element being the numerator, the second the denominator, and the third the resulting approximation.