KING SAUD UNIVERSITY

College of Engineering

GE 209
Introduction to Computer Programming

Laboratory 8

WRITING MATLAB PROGRAMS USING SCRIPT FILES
(PART-1)

Laboratory 8

LABORATORY OBJECTIVES

This lab work is intended to apply what has been covered in the lectures concerning structured program writing using script files; emphasis will be on simple input promts and for-loop.

TASK 1 :

1. Example 1 : writing and testing the illustrative example 1 from lecture slides

the purpose of this program is to read three sides of a triangle (a,b,c)
then compute the perimeter (p) and its area (A)
Useful formulas are as follows :

$$p = a + b + c \qquad s = p/2 \qquad A = \sqrt{s(s-a)(s-b)(s-c)}$$

Answer :
Open a new script file and copy-paste the following listing :

```
% Illustrative example from lecture slides on programming writing
% written by XXXXXX
% the purpose of this program is to read three sides of a triangle (a,b,c)
% then compute the perimeter (p) and its area (A)
% Step 1 : User entered values
a=input('enter the side a of the triangle :');
b=input('enter the side b of the triangle :');
c=input('enter the side c of the triangle :');
% Step 2 : compute perimeter and area
p=a+b+c;
s=p/2;
A=sqrt(s*(s-a)*(s-b)*(s-c));
% step 3 : display results
disp('the perimeter of the triangle is :')
p
disp('the area of the triangle is :')
A
```

Test the execution of the program for different inputs

TASK 2 :

Exercise 2. : write and run illustrative example 2
Write a MATLAB program that <u>computes</u> and <u>plots</u>
the following expression :

$$f = 1 + \frac{x^2}{2!} - \frac{x^4}{4!} + \frac{x^6}{6!} - \cdots = 1 + \sum_{i=1}^{n} \frac{(-1)^{i-1} \cdot x^{2i}}{(2i)!}$$

for a <u>range of (x)</u> values (m-elements) and <u>(n) number</u> of factorial
terms <u>specified by the user</u> of your program.
Answer :
Write the MATLAB program corresponding to example2 of lecture slides and try to understand all steps !

TASK 3 : Graded task

2. Exercise 3 : writing and testing a program on your own (similar to exercise 2)

The purpose of this program is to compute then plot the decaying temperature evolution with varying time. This evolution is defined by the following infinite term series expression :

$$\frac{T - T_\infty}{T_o - T_\infty} = \frac{2}{(\frac{1}{2}\pi)^2} \cdot e^{-\left(\frac{\pi}{2}\right)^2 \cdot k.t} + \frac{2}{\left(\frac{3}{2}\pi\right)^2} \cdot e^{-\left(\frac{3\pi}{2}\right)^2 \cdot k.t} + \frac{2}{\left(\frac{5}{2}\pi\right)^2} \cdot e^{-\left(\frac{5\pi}{2}\right)^2 \cdot k.t} + \cdots = \sum_{i=0}^{n} \frac{2}{\left(\frac{(2i+1)}{2}\pi\right)^2} \cdot e^{-\left(\frac{(2i+1)\pi}{2}\right)^2 \cdot k.t}$$

Note that k=1x10^{-3}, $T_o = 100$ and $T_\infty = 20$

Your program should prompt the user to enter the following :

  * the range of time as [to:step:tf]
  * the number of terms (n) in the inifnite series

Hint : use a for-loop for all times (t) (remember j=1 to length of t

→define a vector i=0..n and another vector u=$\frac{(2i+1)}{2}\pi$

→then use the summation to compute $T = T_\infty + (T_o - T_\infty) \cdot \sum_{i=0}^{n} \frac{2}{\left(\frac{(2i+1)}{2}\pi\right)^2} \cdot e^{-\left(\frac{(2i+1)\pi}{2}\right)^2 \cdot k.t}$

→ finally plot T vs t and add labels

Remember that this exercise is very similar to previous exercise so copy paste the other program and modify to match this problem !

Test your program for t=0 to 3600 steps 100 and n=10 terms then 50 terms then 100 terms