BRAC UNIVERSITY

Inspiring Excellence

Department of Computer Science and Engineering

CSE330: Numerical Methods (Lab)

Assignment 2, Summer 2019

Total Marks: 20

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- Use Matlab to solve the following problems.
- Read the questions carefully and follow the instructions.

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**Marks**

1. 2.5x2 =5

(a) For a given decimal number, write a MatLab function that will return the binary representation of that number. You must run your code with your own **Student ID** to and show your output in binary format. Your function should look like this:

```
function [bin] = dec2bin( num )
```

Here, the returned variable **`bin`** is a String type variable.

(b) Write a MatLab function that will print out the Fibonacci series (click here to learn more) **up to n digits**. Where **n = 7 x Your lab slot number**. Your function should look like this:

```
function [series] = fibonacci( n )
```

Here, the returned variable **`series`** is an array/matrix.

2. For a given unsorted array/matrix, write a **Matlab function** that sorts the array in descending order and returns it. You must use the **Insertion sorting algorithm**(click here to learn more) for this problem. You should run your code with your student ID and show the result. 4

For example: If your student id is 19201723 then the unsorted array will look like this: array = [1 9 2 0 1 7 2 3]. After sorting it should look like this: [9 7 3 2 2 1 1 0]

3. The Bisection method is used for determining roots of a function. In this problem, you have to implement the Bisection method. Your function should look like this: 4

```
function [root, ea]= bisect (f, xl, xu, erlimit, maxit)
```

where,

*f = a function,*

*xl = lower guess,*

*xu = upper guess,*

*erlimit = error limit,*

*maxit = maximum allowable iteration number,*

*root = the root calculated by the bisection method,*

*ea = approximate relative error,*

Find the root of the following function with your method within the range of [3,4], acceptable error 0.001:

$$f(x) = e^{-x}(3.2\sin(x) - 0.5\cos(x))$$

4. For this problem, assume that you are the CEO of Marvel Entairteiment, which is a film publishing company. Over the past ten years, your company has created a movie franchise called Marvel Cinematic Universe(aka MCU) and released around 23 superhero movies. The following table shows the positive fan reviews and earnings. 1+4+2 =7

| **Film Name** | **Review (in%)** | **Earnings (in million)** |
|---|---|---|
| Iron Man | 65 | 585.17 |
| The Incredible Hulk | 61 | 263.42 |
| Iron Man 2 | 57 | 623.93 |
| Thor | 56 | 449.32 |
| Captain America: The First Avenger | 66 | 370.56 |
| Marvel's The Avengers | 78 | 1518.81 |
| Iron Man 3 | 77 | 1214.81 |
| Thor: The Dark World | 54 | 644.57 |
| Captain America: The Winter Soldier | 70 | 714.26 |
| Guardians of the Galaxy | 76 | 773.32 |
| Avengers: Age of Ultron | 66 | 1405.40 |

| | | |
|---|---|---|
| Ant-Man | 64 | 519.31 |
| Captain America: Civil War | 75 | 1153.30 |
| Doctor Strange | 72 | 677.71 |
| Guardians of the Galaxy Vol. 2 | 67 | 863.75 |
| Spider-Man: Homecoming | 73 | 880.16 |
| Thor: Ragnarok | 74 | 853.97 |
| Black Panther | 80 | 1346.91 |
| Avengers: Infinity War | 84 | 2048.35 |
| Ant-Man and the Wasp | 70 | 622.67 |
| Captain Marvel | 64 | 1128.27 |
| Avengers: Endgame | 86 | 2773.35 |
| Spider-Man: Far From Home | 73 | 603.77 |

Suppose recently your company has released a new superhero movie called “Captain Marvel Returns” which received around 88% positive reviews form different sources. Based on your previous experience you know that the earning of a movie depends on the positive review. You also remember that you have learned a method in CSE330 course that can help you to predict the future value for a given set of values.

Now, which method should you use to predict the net earning of the latest movie? Write a function that takes the necessary inputs and returns the predicted earning Your function should also show all the points in a plot.

(Important functions for plotting: plot, stem, legend, hold)

- The End -