

ME1 Computing- Session 4: I/O Files and Conditional Flow

Learning outcomes:

- Introduction of I/O Files
- Implement conditional flow
- Being able to select, as necessary, between counted loops and conditional flow

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Before you start

In your H drive create a folder `H:\ME1MCP\Session4` and work within it.

Task A: I/O Files

1. Download the files `CIDs.txt` and `Marks.txt` from Blackboard. The first file stores CIDs numbers of some students, whilst the second file stores their corresponding marks. Write a script to compute the average mark and to find the maximum mark (do not use implicit functions such as `sum()` and `max()`).

Answer Question 1

Task B: Searching values in a list

Using the same data imported from files in Task A:

- 1) Write a script to search and display the score of a student, specifying his/her CID from the keyboard.
- 2) Amend the script in Task A to display the list of students who achieved the maximum mark. Save the list into the file `Best.txt`.

Answer Question 2

Task C: Series expansion

1. The function $y(x) = \frac{1}{1-x}$ can be represented by the series expansion:

$$y(x) = \frac{1}{1-x} = \sum_{i=0}^{N \rightarrow \infty} x^i = 1 + x + x^2 + x^3 + x^4 + \dots$$

in the interval $-1 < x < 1$ only.

Write a script to evaluate the function $y(x)$ in the range $x = [-0.8 \ 0.8]$ with step 0.01 , for values of $N = 2, 6, 10, 14$.

Plot, on the same graph, $y(x)$ vs x in the specified range $x = [-0.8 \ 0.8]$, for each value of N .

Evaluate the analytical value of $y(x)$ in the same range of x and plot it, to compare the exact function with the truncated series.

Answer Question 3

Task D: Series expansions

1. Given the series in Task C, write a script to calculate a finite approximation of such function at a given point x_p , i.e. $y(x_p)$.

Add terms of the series until the approximation reaches a given accuracy.

The accuracy is reached when $|y_{n+1} - y_n| < 10^{-Q}$.

Input the values of x_p and the accuracy Q from the keyboard.

Evaluate the exact value of $y(x_p)$, and display the error from the computed value. Observe the value of the error against 10^{-Q} .

Answer Question 4