

EE 221.1/2021.1
Computer Tools for Electrical Engineers
Makeup Midterm Exam
December 9, 2019
Time Limit: 60 Minutes

Student Name: _____

Student Number: _____

This exam contains 4 pages (including this page) and 7 questions. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may *not* use your books, notes, or electronic devices on this exam.

Do not write in the table below.

Question:	1	2	3	4	5	6	7	Total
Points:	15	15	15	15	15	15	10	100
Score:								

Questions

1. (15 points) Let **a** be an array of integers in the MATLAB workspace. Compute a new array **b**, such that each element at index **i** of the new array **b** is the product of all the numbers in the original array **a** except the one at **i**.

For example, if **a** = [1, 2, 3, 4, 5], **b** would be [120, 60, 40, 30, 24]. If **a** = [3, 2, 0], **b** would be [0, 0, 6].

Answer:

2. (15 points) Let **a** be an array of numbers and **k** be a number in the MATLAB workspace. Write a MATLAB script which determines whether any two numbers from **a** add up to **k**.

For example, if **a** = [10, 15, 3, 7] and **k** = 17, your script would print 'true' to the user since $10 + 7 = 17$.

Answer:

3. (15 points) Let **A** be a $2 \times n$ array in the MATLAB workspace where the elements at the **i**-th column of **A** correspond to the coordinates of **i**-th point in the 2D space. Write a MATLAB script which computes the nearest **k** points stored in the array **A** from any given point **x**.

For example, if **A** = [0 5 3; 0 4 1], and **x** = [1 2]', and **k** = 2, your script would compute [0 0]' and [3 1]'.

Answer:

4. (15 points) Let **a** be an array of integers in the MATLAB workspace. Write a MATLAB script which computes a new array **b** where each element of **b** is the number of smaller elements to the right of that element in the array **a**.

For example, if **a** = [3, 4, 9, 6, 1], **b** would be [1, 1, 2, 1, 0] since:

There is 1 smaller element to the right of 3.

There is 1 smaller element to the right of 4.

There are 2 smaller elements to the right of 9.

There is 1 smaller element to the right of 6.

There are no smaller elements to the right of 1.

Answer:

5. (15 points) Let **a** be an array in the MATLAB workspace. Write a MATLAB script which computes the lowest positive integer (say **b**) that does not exist in the array **a**. Note that the array can contain duplicates and negative numbers as well.

For example, if **a** = [3, 4, -1, 1], **b** would be 2. If **a** = [1, 2, 0], **b** would be 3.

Answer:

6. (15 points) A fixed point in an array is defined as the element whose value is equal to its index. Let **a** be a sorted array of distinct elements in the MATLAB workspace. Write a MATLAB script which finds a fixed point, if one exists. Otherwise, the script would display 'No fixed point exists in the given list' to the user.

For example, if **a** = [6, 0, 3, 40], your script would compute 3. If **a** = [2, 5, 7, 8], your script would display 'No fixed point exists in the given list' to the user.

Answer:

7. (10 points) Let **a** be an array of length $n + 1$ whose elements belong to the set $\{1, 2, \dots, n\}$ in the MATLAB workspace. Write a MATLAB script which finds an element with duplicate.

Answer: