General Instructions

Due Date:
Saturday, April 8 at 11:00pm (submit via blackboard)

Assignment Summary Instructions:
This assignment has three problems summarized below. You will use MATLAB as a tool to solve the problems for the given test cases provided and that it is flexible for any additional test case that might be used to evaluate your code.

- Problem #1: Phase Diagram

Submission Instructions:
You will submit a **.zip file** that will contain the following files:

1. **.m file – Matlab file (separate sections using %% for each problem)**. Your final script should be in the zipped folder and named as **MA#_USERNAME.m (for example, MA7 _dwburles.m).**
2. .pdf file - scan of your algorithm sheet (use the template) for Problem #1

Submit your **.zip file** to blackboard using the Mastery Assignment 1 link. Your final submission should be a zipped folder named as **MA#_USERNAME.zip (for example, MA7_dwburles.zip).** The file must be completely submit before 11pm on April 8 for credit. **No late work is accepted and will result in a zero on the assignment**. It is your responsibility to make sure the file is completely submitted prior to the deadline. You are provided 2 upload opportunities in case your first upload is incomplete or a mistake.

Academic Honesty Reminder:

The work you submit for this assignment should be your work alone. You are encouraged to support one another through collaboration in brainstorming approaches to the problem and troubleshooting. **However, all support should be only verbal in nature**. Sharing files and showing other students your file is considered physical and visual help and is considered an academic honesty violation.

Some examples of academic misconduct in ENGI 1331 include but are not limited to the following actions:

1. Picking up and using or discarding another student's written or computer output;
2. Using the computer account of another student;
3. Representing as one's own the work of another on assignments, quizzes, and projects;
4. Giving another student a copy of one's work on an assignment before the due date.
5. Copying work from online resources (Chegg, google forums, etc.)
6. Posting work to online resources where other students can view your work

This assignment will be checked for similarity using a MATLAB code. The similarity code will check each submission for likeness between other student submissions, past student submissions, the solution manual, and online resources and postings. If your submission is flagged for a high level of similarity, the ENGI 1331 faculty will review the files, and then the guilty parties will be turned in for an academic honesty violation if deemed appropriate.

NOTE: Since this is an automated system for all sections, if any of your work is not your own, you will be caught. Changing variable names, adding comments, or spacing will not trick the similarity algorithm and will result in a violation.

Problem #1

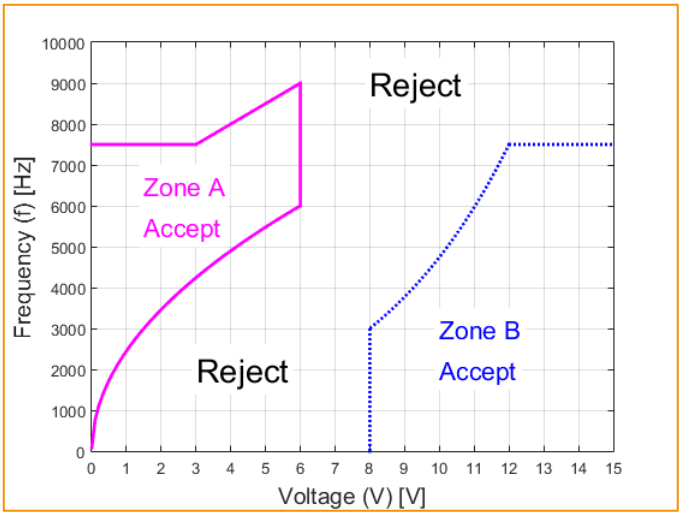
Background: *After numerous experiments with a circuit configuration, you determined that as long as the transistor chosen meets certain criteria, other components in the circuit can be adjusted to yield an ideal frequency response. In the classification diagram shown below, there are two regions where the transistor is acceptable.*

Zone A, shown in solid magenta lines, is defined as:

- a horizontal line at 7500 Hz for voltages from 0 to 3 V;
- a linear line from (3, 7500) to (6, 9000);
- a vertical line at 6 V for a frequency from 6000 to 9000 Hz; and
- a power law curve which extends to (6, 6000), passing through the points (0.15, 1000) and (3, 4244).

Zone B, shown in blue, dashed line segments, defined as:

- a horizontal line at 7500 Hz for voltages from 12 to 15 V;
- a vertical line at 8 V for a frequency from 0 to 3000 Hz; and
- an exponential curve which extends from (8, 3000) to (12, 7500), passing through the point (11, 6000).



If a point falls on a line dividing the "Accept" and "Reject" regions, it is considered acceptable. Create the classification diagram, duplicating the diagram exactly as shown. All lines should have a linewidth of 3. Accept region labels should be in size 16 font, while the Reject region labels will be in size 20 font.

The user will be allowed to repetitively specify a pair of experimental test values for a specific transistor and store the response in the two-element vector **`Test`**. The first value in **`Test`** is the voltage and the second value is the measured frequency. Check if the user has entered a two-element row vector. If the user has entered an incorrect number of elements, give the user two more chances to enter the correct number of elements. If the user fails to enter a matrix correctly within three total tries (the first try + two additional tries), terminate the program.

As long as the user enters a 2-element row vector and a voltage value as the first element in **`Test`** within the range of 0 and 15 volts inclusive, the program will follow these steps, if not the program will throw a warning for the user and loop them back to the beginning of the program.

- The user enters a set of numbers.
- The program checks for the shape of the data entered. If the user does not enter a 1 x 2 vector within three tries, the program will terminate [see information above].
- The program checks that the voltage entered is between 0 and 15 V and the Frequency is between 0 and 10000 Hz. If the user does not enter an appropriate value, ask the user to replace the value that is outside the specified range.
- The program will store the values of V and f for each data entry.
- The program will determine if the V, f pair entered by the user is Accepted or Rejected:
  - If the test value lies in an "Accept" region, the program will store the text "**`Accept Device in Zone #`**" in a variable, where **`#`** is replaced by the letter **`A`** or **`B`** depending on the Zone the point lies in.
  - If the test value is anywhere outside an "Accept" region, the text "**`Reject Device`**" is stored in the variable.
- The point is added to the classification diagram as a size 20 red, solid circle. The center of the circle should contain the point number entered by the user (1 for first point, 2 for second point, etc.)

- The user is asked to enter another pair (using a menu). If yes, the user is prompted to enter another pair. If no, the program will print the results in tabular format, similar to the table shown below. It will also report the number of points accepted and number of points rejected that were entered by the user.

Sample Output (Test Cases) to Command Window

```
Your tests resulted in:
   6     Accepted Devices
   4     Rejected Devices

Entry # | Voltage [V] | Frequency [Hz] | Status
  1              2             1000             Reject Device
  2             11             5000             Accept Device in Zone B
  3              9             1000             Accept Device in Zone B
  4              5             8000             Accept Device in Zone A
  5             13             8000             Reject Device
  6              4             9000             Reject Device
  7             10             7000             Reject Device
  8              1             5000             Accept Device in Zone A
  9              6             5000             Reject Device
 10              3             3000             Reject Device
>>
```