EGR 120
Introduction to Engineering
File: N120H7S

Due date: ____________________
(See Due Dates Table)

Homework Assignment #7 (Excel B)

Reading Assignment:

Read Chapter 13 in Thinking Like An Engineer – An Active Learning Approach, 2nd Edition by Stephan.
Study the PowerPoint presentation – Excel B
Additional examples are available on the instructor's web site (or Blackboard site):

- ***Linear Regression using Microsoft Excel***
- ***Exponential Regression using Microsoft Excel***
- ***Power Regression using Microsoft Excel***
- ***Logarithmic Regression using Microsoft Excel***
- ***Polynomial Regression using Microsoft Excel***

Computer Assignment:

Complete the assignment described below. Use only one Excel file to store all parts of the assignments by placing each part on a different sheet (Sheet1, Sheet2, Sheet3, etc – renamed as Problem 1, Problem 2, Problem 3, etc) within the file. Submit the single Excel file using Blackboard. To submit a file using Blackboard go to where the document is posted, open the link for the assignment, and you will see a place to browse for and attach a file. Once you have done this you will see an exclamation point (!) in the gradebook for this assignment. The exclamation point will be changed to a grade once the instructor has graded the assignment.

> **Warning**: Your assignments must be your own work. You can ask other students questions, but sharing files is cheating. If any evidence of copied files is discovered, all parties involved will receive grades of 0 and may be subject to further disciplinary action.

General instructions for each part: (also see the examples listed above)

A) For each problem:
- Include your name, the course number and name, and the problem number
- List the filename
- Include instructions (or a summary)

B) For each table:
- Include thick lines on the outside, thin lines on the inside, and a thick line around the heading
- Center each column
- Use the exact same number of digits as are provided with the problem (if data is given).
- Include variables and units in the table headings as provided

C) For each graph:
- Use a title that includes your name and the problem number (e.g., John Doe, Problem 5.1)
- Include variable names and units as axis labels
- Include solid major gridlines and dotted minor gridlines
- Make the graph large enough so that features can be clearly seen
- Remove any shading in the graph area
- Use XY (scatter plots) with no lines and then add a trendline
- All numbers on the axes should be outside of the graph area
- Show both the trendline equations and the value of R^2. Move them to an area where they are easily readable.
- Replace x,y in the trendline equation with the proper variable names.
- Use the appropriate scale (linear or log) for each type of trendline as follows:

Type of trendline	x-axis	y-axis
Linear	Linear	Linear
Exponential	Linear	Log
Logarithmic	Log	Linear
Power	Log	Log
Polynomial	Linear	Linear

1. <u>Problem ICA 13-1</u> in the textbook (p. 449).
   Additional specifications:
   - Radius is the independent variable.
   - Show three graphs instead of one. Show one graph with a linear trendline, one graph with an exponential trendline, and one with a power trendline. Show the trendline equation and R^2 for each. Use appropriate linear or log scales in each case.
   - Which trendline above fits best? Why?
   - Use the trendline equation that fits best found above in an Excel formula to calculate the predicted height for a radius of 0.02, 0.45, and 0.75 cm. Put these three results in a separate table. Show a sample Excel formula below the table.

2. <u>Problem ICA 13-4</u> in the textbook (p. 449).
   Additional specifications:
   - Diameter is the independent variable.
   - Show three graphs instead of one. Show one graph with a linear trendline, one graph with an exponential trendline, and one with a power trendline. Show the trendline equation and R^2 for each. Use appropriate linear or log scales in each case.
   - Which trendline above fits best? Why?
   - Use the trendline equation that fits best found above in an Excel formula to calculate the predicted power for impeller diameters of 1.25, 1.75, and 3.50 ft. (Answer to check your results: P ***= 2.13 hp for D = 1.75 ft***). Put these three results in a separate table. Show a sample Excel formula below the table.

3. <u>Problem 7 in the Chapter 13 Review Questions</u> in the textbook (p. 458).
   Additional specifications:
   - Day is the independent variable.
   - As indicated in the problem, use the trendline equation that fits best found above in an Excel formula to calculate the results for parts b, c, and d. (Answer to check your results: ***Number of lesions per leaf = 2.52 on Day 97***). Show a sample Excel formula below the table.

(continued)

4. <u>Weight versus diameter for a wire rope (cable)</u>.

   A) Create a spreadsheet containing the table of information below and form a graph of Weight versus Diameter. Diameter is the independent variable. Determine the **<u>power equation</u>** that represents the data.

   B) Use the trendline equation found above in an Excel formula to calculate the predicted weight for diameters of 1.40, 5.00, and 10.00 inches. (Answer to check your results: ***W = 237.2 lbf/ft for D = 10 in***). Show a sample Excel formula below the table.

Table 4A: Weight per foot of wire rope

Diameter, D (in)	Weight, W (lbf/ft)
0.75	1.41
1.00	2.50
1.25	3.91
1.50	5.63
1.75	7.66
2.00	10.00
2.25	12.50
2.50	15.2
2.75	18.3
3.00	22.2
3.50	29.9
4.00	38.4

5. <u>Charge versus time for a capacitor</u>.

   A) Create a spreadsheet containing the table of information below and form a graph of Charge versus Time. Time is the independent variable. Determine the **<u>exponential equation</u>** that represents the data. Note: The scientific notation format shown below is different from what you will see in Excel.

   B) Use the trendline equation found above in an Excel formula to calculate the predicted charge for times of 0.75, 1.00, and 1.50 seconds. (Answer to check your results: ***W = 5.57E-8 C for t = 1.50 s***) Show a sample Excel formula below the table.

Table 5A: Charge versus time for a capacitor

Time, t (s)	Charge, Q (C)
0.0	2.50×10^{-5}
0.1	1.68×10^{-5}
0.2	1.13×10^{-5}
0.3	7.50×10^{-6}
0.4	5.00×10^{-6}
0.5	3.50×10^{-6}
0.6	2.30×10^{-6}
0.7	1.50×10^{-6}
0.8	1.00×10^{-6}
0.9	8.00×10^{-7}

6. <u>Mass versus Angle for a mousetrap</u>.
A mousetrap was tested by connecting a wheel to the striking arm and then adding different masses to a string wrapped around the wheel as shown in the diagram below. The data in the table shown was collected.

A) Create a spreadsheet containing the table of information provided. You do not need to include the diagram.
B) Form a graph of Mass versus Angle. Angle is the independent variable.
C) Add linear, exponential, and power trend lines to the graph. Show the equation and R^2 for each trend line. Which trend line fits best? Use linear/log scales to match the best fit trendline. Use the appropriate linear/log scales based on the trendline that you choose.
D) State the best equation in a box using a Microsoft Equation 3.0.
E) Use the trendline equation found above in an Excel formula to calculate the predicted mass for angles 30, 90, 120, and 180 degrees. (Answer to check your results: ***Mass = 745 g for Angle =180 degrees***)

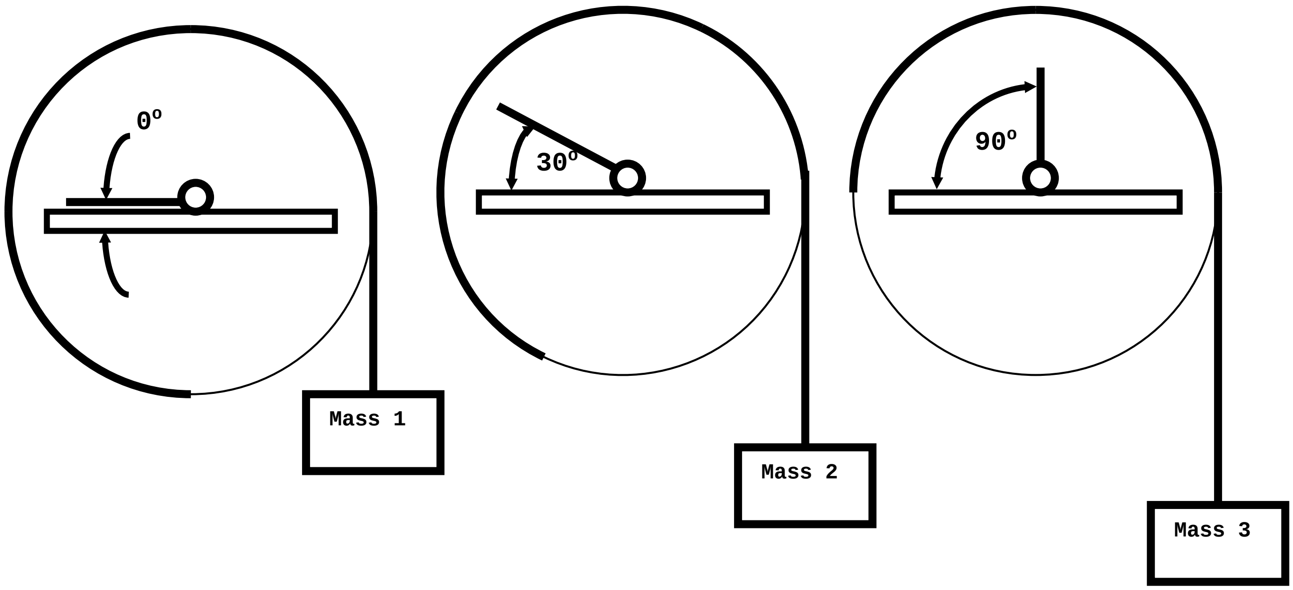

Table 6A: Mass versus Angle for a Mousetrap

Angle, A (degrees)	Mass, m (g)
2	200
15	250
25	300
39	350
54	400
70	450
105	500
115	550
128	600
147	650
167	700