Assignment 2: Excel Functions

Date Due: February 7, 2022. Instructor: Trani

Show all your work including VBA code and results of your computation in the spreadsheet as screen captures.

Problem 1

Review the formulas to estimate the deflection of a beam at: https://mechanicalc.com/reference/beam-deflection-tables.

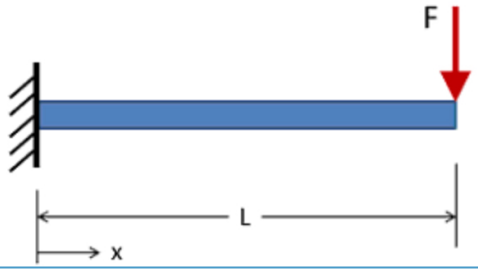
Cantilever, End Load		*Deflection:* $\delta = -\frac{Fx^2}{6EI}(3L - x)$ $\delta_{max} = \frac{FL^3}{3EI} \quad @\, x = L$ *Slope:*

Figure 1. Uniformly Loaded Beam. Source: https://mechanicalc.com/reference/beam-deflection-tables.

Note: You will get no credit if you just do regular Excel computations in a spreadsheet and do not show your VBA code.

L = beam length (m)

x = beam station (m) measured from the wall

E = Modulus of Elasticity (N/m^2)

I = moment of inertia of the beam (m^4)

F = applied load in Newtons

δ = deflection in meters at beam station (x)

a) Create a function in Excel (using VBA) to calculate the deflection of the beam at any point x. The function should produce the deflection (δ) given the values of E, I, F, x, and L to estimate the deflection at point x.
b) Use the function created above to estimate the deflections along the seven-meter beam every 20 centimeters. You should create a table in Excel to call the function and estimate the deflection every 20 centimeters. Use the numerical values F = 5000 N, L=7 m, I = 0.0001 (m^4) and E = 200e9 (N/m^2).
c) Plot the deflections along the beam and label accordingly.

Problem 2

Read the car data file provided in class (week 1). The car weights are in pounds and horsepower in HP.

Auto data for several vehicles is contained in the file Car data.txt. The data file contains various characteristics for automobiles produced in various countries. Show all your work and provide screen captures of your work and **include the actual database commands** used to make each query.

a) Calculate the average weight for cars produced in Japan with weight >2500 lb.

b) Calculate the average weight for American-made cars whose tank size > 18.5 gallons

c) Count the number of cars with horsepower > 190 HP and tank size > 17 gallons.

Problem 3

Use the file contructionEquipmentAssets.xlsx that contains information about a company construction equipment. A sample portion of the spreadsheet is shown below.

	A	B	C	D	E
1	Equipment	Status	Value ($)	Odometer_Miles	Age
2	Loader	Active	308,135	100,359	12.3
3	Loader	Active	305,851	87,749	11.4
4	Excavator	Active	286,810	75,681	5.8
5	Excavator	Active	295,373	83,339	7.6
6	Paver	Active	315,795	105,786	7.6

a) Create a pivot table to summarize the different types of construction equipment by for the company. The pivot table should report the average odometer miles of each construction equipment.

b) Create a pivot chart to summarize the different types of construction equipment by city for the company. The pivot chart should report (graphically) the average odometer miles of each construction equipment.

c) Modify the solution to part (a) and add a filter to the pivot table to select the status of the equipment. Show the pivot table showing the solution for the number of Excavators in Maintenance.

Problem 4

Use the file contructionEquipmentAssets.xlsx that contains information about a company construction equipment to answer the following questions. Here we use the Excel database functions. Show your database commands in the solution (i.e., the formula bar).

a) Use Excel database functions to count the number of loaders in the company.

b) Use Excel database functions to estimate the average value of trucks in the company with more than 8 years of age and less than 12 years of age.

c) Use Excel database functions to count the number of trucks in part (c).

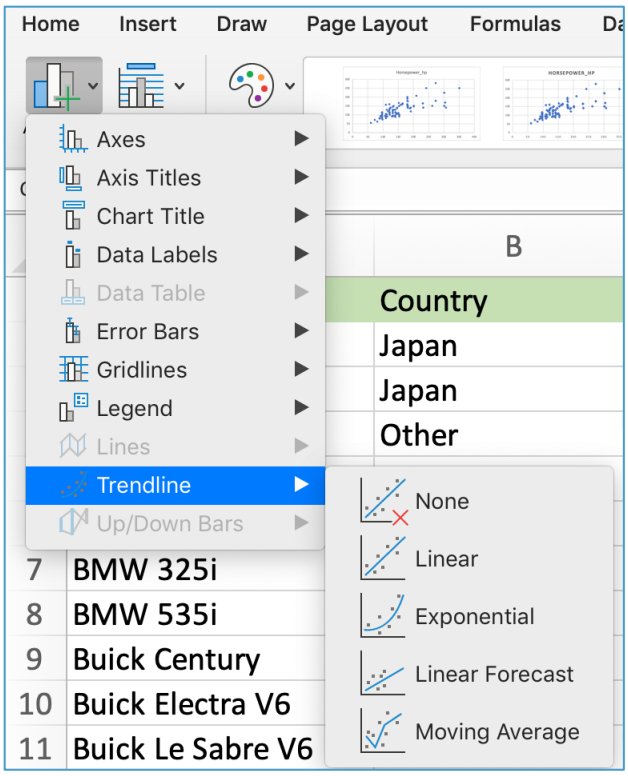
Problem 5

Read the car data file provided in class (week 1). A sample of the data is shown below.

Model	Country	Type	Weight_lbs	Turning Circle_ft	Displacement_cInch	Horsepower_hp	Gas Tank Size_gallons
Acura Integra	Japan	Small	2700	37	112	130	13.2
Acura Legend V6	Japan	Medium	3265	42	163	160	18
Audi 100	Other	Medium	2935	39	141	130	21.1
Audi 80	Other	Compact	2670	35	121	108	15.9
Audi 90	Other	Compact	2790	35	141	130	15.9
BMW 325i	Other	Compact	2895	35	152	168	16.4
BMW 535i	Other	Medium	3640	39	209	208	21.1
Buick Century	USA	Medium	2880	41	151	110	15.7

a) Import the data into Excel.

b) Perform a **simple linear regression** using Excel to estimate the best model that relates vehicle engine displacement (called displacement in the data set – in cubic inches) and horsepower. Use the **trend analysis function in Excel** to estimate the equation of the line that fits the data best.



The steps to make a trend line from a chart are:

i) Select the chart.

ii) Click the + button on the right side of the chart or select the Add Chart Element in the Chart Design Tab.

iii) Select the Trendline and make your selection of Options.

c) Create a function in Excel (using VBA) to calculate the horsepower (in units of horsepower) of a vehicle as a function of engine displacement (cubic inches).

d) Test the function created in part (c) to estimate the horsepower expected for an engine with 165, and 300 cubic inches of engine displacement.