Assignment 2: Excel Functions

Date Due: February 5, 2021 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 uniformly loaded beam at: https://mechanicalc.com/reference/beam-deflection-tables.

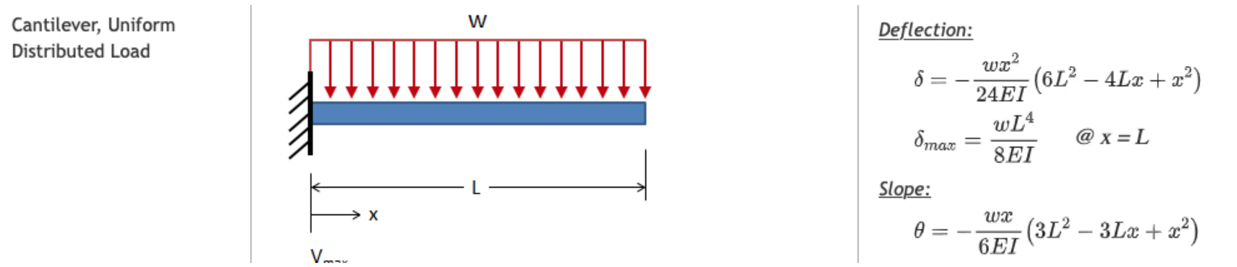

Figure 1. Uniformly Loaded Beam. Source: https://mechanicalc.com/reference/beam-deflection-tables.

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)

W = 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 The function uses arguments E, I, W, x and L to estimate the deflection at point x.
b) Use the function created above to estimate the deflections along the beam every 10 centimeters. Use the numerical values W = 5000, L=9 m, I = 0.0001 (m^4) and E = 200e9 (N/m^2).
c) Plot the deflection vs beam station and label accordingly.
d) Create a second function in Excel to estimate the maximum deflection of the beam (δ_{max}) using the necessary input arguments.
e) Create a third function in Excel to estimate the slope of the beam deflection (theta) using the necessary input arguments.

Problem 2

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

a) Import the data into Excel.
b) Perform a simple linear regression using Excel to estimate the best model that relates vehicle weight and horsepower. Use the trend analysis in Excel.
c) Create a function in Excel (using VBA) to calculate the horsepower of a vehicle as a function of weight.
d) Use the function created in part © to estimate the horsepower needed for a car with weights 3,250 and 5,400 lbs.

Problem 3

Use the file consulting_firm_practice_forWeb.xls that contains information about a company construction equipment.

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

b) Create a pivot chart to summarize the different types of construction equipment by city for the company. The pivot chart should plot the average value of each construction equipment by city.

c) Use another pivot table to count the different types of construction equipment by city.

d) Create a pivot chart to plot the number (or count) of different types of construction equipment by city.

e) Use a pivot table to find the average value of Loaders in the company that are in service.

f) Use a pivot table to find the number of Scrapers in the company that are in maintenance.

Problem 4

Virginia DOT plans to expand Interstate I-81 with two additional lanes between Roanoke and Christiansburg. The $463 Million dollar project is to be financed with a loan with interest rate of 3.75% per year at 25 years.

a) Estimate the monthly payments to pay the loan over 25 years. Show all your Excel formulas and work.

b) How much would the Government save if the loan is paid in 15 years instead?