

## Quiz 1 (Take Home)

Date: March 1, 2021

Instructor: Trani

**Open book and notes, use of computer is allowed**

## Honor Code Pledge

The information provided in this exam is my own work. I have not received information from another person while doing this exam.

Your Name : \_\_\_\_\_

## Problem 1 (30 Points)

Show all your work and screen captures with formulas (if applicable) to receive credit.

The data provided in the spreadsheet (see Table 1) contains the aircraft fleet information for four airlines. A sample table is shown below.

	A	B	C	D	E	F
1	<b>Airline Name</b>	<b>Manufacturer</b>	<b>Aircraft Type</b>	<b>Engine Type</b>	<b>Age (years)</b>	<b>Flight Hours (hrs)</b>
2	Piedmont Airlines	Boeing	737-800	CFM56-7B26	15	49,395
3	Piedmont Airlines	Boeing	737-800	CFM56-7B26	15	50,645
4	Piedmont Airlines	Boeing	737-800	CFM56-7B26	15	52,307
5	Piedmont Airlines	Boeing	737-800	CFM56-7B26	15	51,355
6	Piedmont Airlines	Boeing	737-800	CFM56-7B26	15	51,007
7	Piedmont Airlines	Boeing	737-800	CFM56-7B26	15	52,181
8	Piedmont Airlines	Boeing	737-800	CFM56-7B26	15	52,759
9	Piedmont Airlines	Boeing	737-800	CFM56-7B26	15	51,672
10	Piedmont Airlines	Boeing	737-800	CFM56-7B26	15	52,188
11	Piedmont Airlines	Boeing	737-800	CFM56-7B26	15	49,545

- Create a Pivot table that shows a summary the aircraft types own by each airline.
- Create a second Pivot Table to display in one column, the average age of each aircraft group by company and in another column or row (your choice) the average number of hours flown by each aircraft type.
- Find the average age and the number of Boeing 737-800 and the DC-9-83 (MD-83) in the fleet of Piedmont Airlines.
- Using another Pivot Table, find the average number of hours flown by Airbus A320-232 aircraft with engines of the type V2527-A5.
- Use Excel database function to find the number of A321-211 aircraft with CFM56-5B3/3B1 engines that are older than 8 years.
- Use Excel database function to find the average flight hours of 767-200ER aircraft with CF6-80C2B2 engines.
- Perform a linear regression using Excel or Matlab (your choice) to find the best equation of a line that relates flight hours vs. age for the entire fleet. Use the regression equation found to estimate the average flight hours of an aircraft that has been in service for 23.6 years.

## Problem 2. (30 points)

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**Show all your work. Include screen captures the VBA code and the spreadsheet input and output data.**

A formula to estimate the noise generated by a train is found to be:

$$Leq = SEL_{ref} + 10 \log(N_{cars}) + 20 \log(S/50) + 10 \log(V) - 31.6$$

where:

Leq = equivalent noise level (decibels - dBA)

SEL ref = reference sound exposure level (decibels - dBA)

Ncars = number of cars in the train

S = train speed (mph)

V = hourly average train volume (trains per hour)

log = natural log of the number

a) Write a **VBA subroutine (not a function)** without arguments in Visual Basic for Applications (VBA) to calculate the value of Leq given values of S (speed), SELref (sound exposure level), Ncars (train cars), and hourly train volume (V). The values of S, SELref, Ncars and V are entered in the worksheet and should be read by your Visual basic code. Write back the result from the Visual Basic code calculation obtained for Leq to the worksheet in cell B12.

In your calculations assume the train has 12 cars, the hourly train volume is 30 trains/hr, Sref is 55, and the train travels at 45 mph.

b) Create a table with solution for Leq as a function of train speed. Use speed values ranging from 10 to 50 mph. The table should be created in VBA code.

c) A sensitive community next to the train tracks requires trains to be operated below 65 dBA equivalent noise level. Using the solutions found in part (b) estimate the maximum speed of the train near the noise sensitive community.

### Problem 3 (40 Points)

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**Show all your work. Include screen captures the Excel file and Solver panel.**

An engineer formulates a linear programming with two decision variables as follows:

$$\text{Maximize } Z = 250x_1 + 730x_2$$

Subject to:

$$x_1 + 2.1x_2 \leq 63$$

$$1.26x_1 + 1.1x_2 \leq 56$$

$$0.95x_2 - 1.30x_1 \leq 10$$

and

$$x_1 \geq 0, x_2 \geq 0$$

- Write down the problem in Standard (canonical) form.
- Solve the problem by hand using the Simplex method. Clearly show each tableau and the types of algebraic operations used in every step.
- For each tableau indicate the current solution and the value of the objective function.
- Find the optimal solution to the problem.
- Solve the problem using Excel Solver to verify the manual answer. Show me the Solver panel and label accordingly.