Assignment – 2

[Q1]

- Let the joint probability density function for (X, Y) be

$$f(x,y) = \begin{cases} \frac{1}{2}e^{-y} & 0 < y < \infty, -y < x < y \\ 0 & otherwise \end{cases}$$

(a) Find the marginal probability density function of X, f_x(x).

(b) Find the marginal probability density function of Y, f_y(Y).

(c) Are X and Y independent? If not, find Cov(X,Y).

[Q2]

Consider a small ferry that can accommodate cars and buses. The toll for cars is $3, and the toll for buses is $10. Let X and Y denote the number of cars and buses, respectively, carried on a single trip. Suppose the joint distribution of X and Y is as given in the table below. Compute the expected revenue from a single trip.

P (X, Y)		Y		
		0	1	2
X	0	0.025	0.015	0.010
	1	0.050	0.030	0.020
	2	0.125	0.075	0.050
	3	0.150	0.090	0.060
	4	0.100	0.060	0.040
	5	0.050	0.030	0.020

[Q3]

Prove:

Use the rules of expected value to show that Cov(aX + b, cY + d) = ac Cov(X, Y)

Use above relation along with the rules of variance and standard deviation to show that Corr(aX + b, cY + d) = Corr(X, Y) when a and c have the same sign.

[Q4]Find out the relation between Variance(X), Variance(Y), Covariance(X,Y) and Variance(X+Y).

[Q5] What are Outliers?

[Q6] What happens when we increase Dimensionality of dataset?

[Q7] use the given dataset to plot the asked graph and write your conclusions based on the graphs.

Dataset:https://drive.google.com/file/d/1OHbwjXC9CSBPMgBDU9wOlfK60sP_QF65/view?usp=sharing

1. Create scatter plots among all the applicable variables?
2. Create boxplots for ‘tax’ data in each type of fuel type?
3. Create histogram for ‘year’ and ‘price’?
4. Find the correlation between all the variables(heatmap is recommended)?
5. Identify the categorical variables and create countplot for each variable?
6. Find which model has been sold most in the year 2017?
7. Find which transmission type has the highest mean price?
8. Create a line plot of price variation over the year?
9. Create a pie chart to display the percentage of fuel types in this data?
10. Find which fuel type has the minimum, maximum and mean mileage?