Homework Assignment-10

POM 500 Statistical Analysis

Note: Attempt all questions as per the rubric. The problem including the case study has a weightage of 10 marks each. The maximum you can score is 50. Use the Excel function wherever possible.

Problem-1

Max believes that the sales of coffee at his coffee shop depend upon the weather. He has taken a sample for 5 days. Below you are given the results of the sample.

Cups of Coffee Sold	Temperature
350	50
200	60
210	70
100	80
60	90
40	100

a) Which variable is the dependent variable?

b) Compute the least squares estimated line.

c) Compute the correlation coefficient between temperature and the sales of coffee.

d) Predict sales of a 90-degree day.

Problem-2

The following data represent a company's yearly sales volume and its advertising expenditure over a period of 8 years.

Year	Sales in Millions of Dollars	Advertising in ($10,000)
1994	15	32
1995	16	33
1996	18	35
1997	17	34
1998	16	36
1999	19	37
2000	19	39
2001	24	42

a) Develop a scatter diagram of sales versus advertising.

b) Use the least-squares method to compute an estimated regression line between sales and advertising.

c) If the company's advertising expenditure is $400,000, what are the predicted sales?

d) What does the slope of the estimated regression line indicate?

e) Compute the coefficient of determination and fully interpret its meaning.

Problem-3

A market research analyst for a brand of cereal is interested in finding out if there is a relationship between the sales generated and the shelf space used to display the cereal. She conducted a study and collected data from 12 different stores selling this brand of cereal.

Shelf Space, Sq in	Sales, $
574	960
635	1779
533	651
560	831
628	1460
615	1370
540	851
587	1220
656	1889
594	1370
622	1609
567	1120

The data contains sales $ generated for a certain month and the shelf space dedicated to the product. Analyze this data using the appropriate method (Compute regression equation and the coefficient of determination).

Problem-4

The following data show the brand, price ($), and overall score for stereo headphones that were tested by Consumer Reports. The overall score is based on sound quality and the effectiveness of ambient noise reduction. Scores range from (lowest) to (highest).

Brand	**Price**	**Score**
Bose	180	76
Skullcandy	150	71
Koss	95	61
Phillips/O'Neill	70	56
Denon	70	40
JVC	35	26

(a) Compute the estimated regression equation.

(b) Compute SST, SSR, and SSE. (Three decimal places).

(c) Compute the coefficient of determination. (Three decimal places).

(d) What is the value of the sample correlation coefficient? (Three decimal places).

Case study: The U.S. Department of Transportation

As part of a study on transportation safety, the U.S. Department of Transportation collected data on the number of fatal accidents per 1000 licenses and the percentage of licensed

drivers under the age of 21 in a sample of 42 cities. Data collected over one year follow. These data are contained in the file ***Safety***.

a) Develop numerical and graphical summaries of the data.

b) Use regression analysis to investigate the relationship between the number of fatal accidents and the percentage of drivers under the age of 21. Discuss your findings.

c) What conclusion and recommendations can you derive from your analysis?