

## CHAPTER XI

### CORRELATION AND REGRESSION ANALYSIS

#### EXERCISES XI

##### PROBLEM 1

Following data are obtained in the study of the stress ( $X$ )-strain ( $Y$ ) relationship of a certain material:

$X$	0.1	0.3	0.5	0.8	1.0	1.2	1.5
$Y$	1	4	6	8	10	11	17

Find the coefficients of the regression line of the strain on stress. Estimate the strain that would be caused by a stress equal to 1.1.

##### PROBLEM 2

Elastic limits ( $X$ ,  $\text{kg/cm}^2$ ) and breaking strengths ( $Y$ ,  $\text{kg/cm}^2$ ) of steel bars are measured with the following results:

$X$	7283	6512	5193	5330	5440	5069	5222
$Y$	9542	8936	8147	7717	7366	7823	7803

$X$	5545	5425	4650	4569	4830	4847
$Y$	7974	8340	7339	7108	7698	7850

- Compute the correlation coefficient between  $X$  and  $Y$ . Is it significantly different from zero?
- Find the coefficients of the regression line of  $Y$  on  $X$ .
- Estimate the breaking strength that corresponds to the elastic limit of  $X=5000$ .

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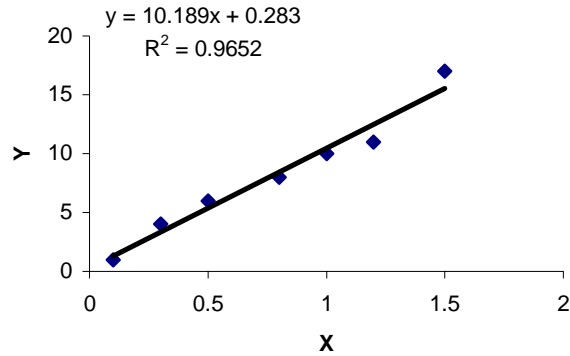
EXERCISES XI

SOLUTIONS

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#### SOLUTION 1

<b>Statistics</b>	<b>X</b>	<b>Y</b>
	0.1	1
	0.3	4
	0.5	6
	0.8	8
	1	10
	1.2	11
	1.5	17
<b>Correlation</b>	<b>0.982467962</b>	
<b>Mean</b>	<b>0.771429</b>	<b>8.142857</b>
<b>S. Deviation</b>	<b>0.502375</b>	<b>5.209881</b>
<b>C. of regression</b>	<b>10.18868</b>	<b>0.283019</b>
<b>For X = 1.1; Y = 10.189 * 1.1 + 0.283 ⇒ Y = 11.49</b>		



#### SOLUTION 2

<b>Statistics</b>	<b>X</b>	<b>Y</b>
	7283	9542
	6512	8936
	5193	8147
	5330	7717
	5440	7366
	5069	7823
	5222	7803
	5545	7974
	5425	8340
	4650	7339
	4569	7108
	4830	7698
	4847	7850
	<b>Correlation</b>	<b>0.911554973</b>
<b>Mean</b>	<b>5378.077</b>	<b>7972.538</b>
<b>S. Deviation</b>	<b>756.7474</b>	<b>663.3509</b>
<b>C. of regression</b>	<b>0.799052</b>	<b>3675.173</b>
<b>For X = 5000; Y = 0.7991 * X + 3675.2 ⇒ Y = 7670.7</b>		

