Dawson College: Civil Technology: 201-912-DW 02

December 4, 2009

Name SOLUTIONS

Student ID: _____

Quiz 11

Question 1. *(10 marks)* The amplitude if oscillation of a TV antenna tower was measured for different peak wind velocities given in the table below. Plot these data points and supper imposes over them the best fit line graph. Calculate the linear correlation coefficient r. Estimate the the amplitude for a peak velocity of 100km/h.

Velocity	30	50	80	120	90	60	60	100	(km/h)
Amplitude	10	30	50	80	80	40	60	90	(cm)

	x	x^2	y	y^2	xy
1	30	900	10	100	300
2	50	2500	30	900	1500
3	80	6400	50	2500	4000
4	120	14400	80	6400	9600
5	90	8100	80	6400	7200
6	60	3600	40	1600	2400
7	60	3600	60	3600	3600
8	100	10000	90	8100	9000
	590	49500	440	29600	37600
	Σx	Σx^2	Σy	Σy^2	Σxy

$$SS_x = \Sigma x^2 - \frac{(\Sigma x)^2}{n} = 49500 - \frac{(590)^2}{8} = 5987.5$$

$$SS_y = \Sigma y^2 - \frac{(\Sigma y)^2}{n} = 29600 - \frac{(440)^2}{8} = 5400$$

$$SS_{xy} = \Sigma xy - \frac{(\Sigma x)(\Sigma y)}{n} = 37600 - \frac{(590)(440)}{8} = 5150$$

$$r = \frac{SS_{xy}}{\sqrt{SS_x SS_y}} = \frac{5150}{\sqrt{5987.5 \cdot 5400}} = 0.91,$$

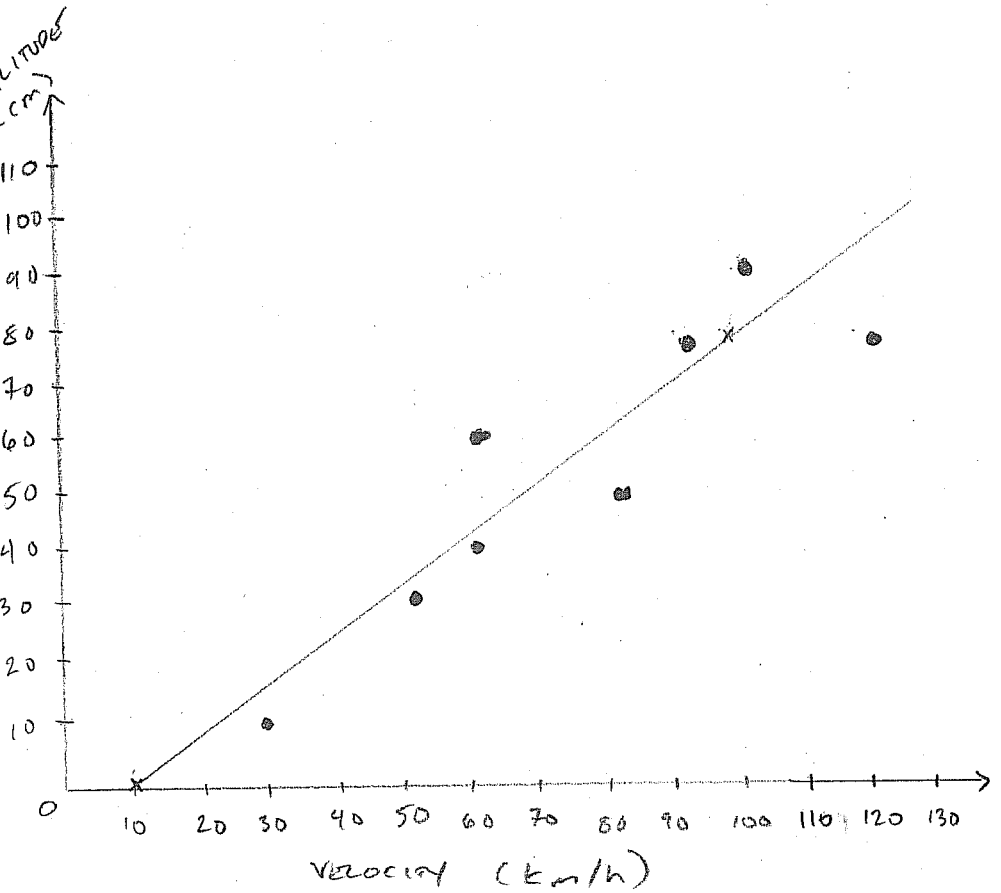
$$\bar{y} = \frac{\Sigma y}{n} = \frac{440}{8} = 55$$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{590}{8} = 73.75$$

$$b = \frac{SS_{xy}}{SS_x} = \frac{5150}{5987.5} = 0.860,$$

$$a = \bar{y} - b\bar{x} = 55 - 0.860(73.75) = -8.425$$

$\therefore$ LEAST SQUARES LINE: $y = 0.860x - 8.425$



$y = 0.860x - 8.425$

$x = 10 \Rightarrow y = 0.860(10) - 8.425 = 0.175 \quad \therefore (10, 0.175)$

$x = 100 \Rightarrow y = 0.860(100) - 8.425 = 77.58 \quad (100, 77.58)$

Velocity: $x = 100 \text{ km/h}$

$y = 0.860(100) - 8.425 = 77.58$

$\therefore$ AMPLITUDE: 77.58 cm