

# Mechanics Engineering

## Engineering Mathematics

### Assignment 6

$t(\text{hrs})$	$d(\text{cm})$
0	2
1	5
2	19
3	50
4	151
5	470
6	1435
7	4512
8	12936
9	41125
10	111021

$$d \propto B^t$$

$$\log d = \log \alpha + \log B^t \quad \text{Taking the log at both sides}$$

$$\log d = \log \alpha + t \log B$$

$$y = a_0 + a_1 x$$

$$a_1 = \log B, \quad x = t, \quad a_0 = \log \alpha, \quad y = \log d$$

$$y = a_0 + a_1 x$$

$$\sum y = n a_0 + a_1 \sum x \quad \text{--- (1)}$$

$$\sum xy = a_0 \sum x + a_1 \sum x^2$$

where  $n=11$

from the table

$$\sum x = 55$$

$$\sum y = 29.4113$$

$$\sum xy = 197.8264$$

$$\sum x^2 = 385$$

$$\sum y^2 = 103.962$$

$t_{xy}$	$d_{xy}$	$\lg d_{xy}$	$y_{cx}$	$x^2$	$y^2$
0	2	0.30103	0	0	0.090619
1	5	0.69894	0.67591	1	0.4886
2	14	1.278754	2.587509	4	1.6352
3	50	1.64597	5.09697	9	2.8570
4	151	2.178932	8.715908	16	4.7479
5	470	2.672068	13.36049	25	7.1401
6	1435	3.156852	18.9411	36	9.9657
7	4512	3.6544	25.5806	49	12.1344
8	12936	4.1118	32.8944	64	16.7076
9	41125	4.614126	41.52692	81	21.2800
10	11021	5.0434	50.4841	100	25.4651
55	17726	29.41135	199.8269	385	103.962

$$29.41133 = 11a_0 + 55a_1 \quad \text{--- (1)}$$

$$199.8269 = 55a_0 + 385a_1 \quad \text{--- (2)}$$

$$29.41133 - 5a_1 = 11a_0$$

$$a_0 = \frac{29.41133 - 55a_1}{11} \quad \text{--- (3)}$$

sub eqn (3) in 2 we have

$$199.8269 = 85 \left( \frac{29.41133 - 55a_1}{11} \right) + 385a_1$$

$$199.82692 = 5(29.41133 - 55a_1) + 385a_1$$

$$199.82692 = 142.05665 - 275a_1 + 385a_1$$

$$199.8269 = 142.05665 = 385a_1 - 275a_1$$

$$52.77025 = 110a_1$$

$$a_1 = \frac{52.77025}{110}$$

$$a_1 = 0.4797$$

sub  $a_1$

$$a_0 = \frac{29.41133 - 55(0.4797)}{11}$$

$$a_0 = 0.2752$$

$$a_0 = \log \alpha$$

$$\alpha = \log^{-1} a_0$$

$$\alpha = \log^{-1} 0.2752$$

$$\alpha = 1.8845$$

$$a_1 = \log \beta$$

$$\beta = \log^{-1} a_1$$

$$\beta = \log^{-1} 0.4791$$

$$\beta = 3.0179$$

$$\text{Correlation Coefficient } R = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{(N \sum x^2 - (\sum x)^2)(N \sum y^2 - (\sum y)^2)}}$$

$$R = \frac{(11 \times 199.8209) - (55 \times 29.41133)}{\sqrt{((11 \times 385) - 55)^2 ((11 \times 10.962) - 29.41133)^2}}$$

$$R = 0.999860887$$

$$R^2 = (0.999860887)^2$$

$$R^2 = 0.999722011$$

$$R = 0.9998$$

The above answer shows that  $R^2 < R$  because the value of the square of the correlation coefficient is less than the actual value of the correlation coefficient.