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16/ENG04/043
ENG 382.
Electrical Electronics.

t(hr)	0	1	2	3	4	5	6	7	8	9	10
d(cm)	2	5	19	50	151	470	1435	4512	12936	41125	111021

$d = \alpha\beta^t$

$\ln d = \ln\alpha + \ln\beta^t$

$\ln d = \ln\alpha + t\ln\beta$

$y = a_0 + a_1 x$

$a_0 = \ln\alpha \quad a_1 = \ln\beta \quad y = \ln d \quad t = x$

$\Sigma y = N \cdot a_0 + a_1 \Sigma x$

$\Sigma yx = a_0 \Sigma x + a_1 \Sigma x^2$

$y = \ln d$	~~$\ln\alpha = a_0$~~	xy	x^2	y^2
0.693192	0	0	0	0.4804
1.609457	1	1.609437	1	2.57107
2.944438	2	5.8889	4	8.66972
3.912023	3	11.7360	9	15.30392
5.017279	4	20.069	16	25.1731
6.152732	5	30.764	25	37.85612
7.268920	6	43.6135	36	52.8372
8.414495	7	58.9015	49	70.80374
9.067769	8	75.742	64	89.63866
10.62437	9	95.6193	81	112.8773
11.61747	10	116.177	100	135.0084
67.7221	55	460.118	385	551.2328

$67.7221 = 11 \times a_0 + 55 \times a_1$

$460.118 = 55 a_0 + 385 a_1$

Using simultaneous eqn.

q

6 $a_0 = 0.6334$

$a_1 = 1.1046$

$a_0 = \ln \alpha$

$\alpha = e^{a_0}$

$\alpha = e^{0.6334}$

$\alpha = 1.8840$

$a_1 = \ln \beta$

$\beta = e^{a_1}$

$\beta = e^{1.1046}$

$\beta = 3.0144$

$d = 1.8840(3.0144)^t$

Correlation coefficient

$$R = \frac{N\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{[N\Sigma x^2 - (\Sigma x^2)][N\Sigma x^2 - (\Sigma y)^2]}}$$

$$R = \frac{11 \times 460.118 - 55 \times 67.722}{\sqrt{(11 \times 385 - 55^2) \times (11 \times 551.234 - (67.7221)^2]}}$$

$R = 0.99984$

$R^2 = (0.99984)^2 = 0.99968$

For matlab:

$R = 0.9998$

$R^2 = 0.9997$

For observation for all the methods used to solve the correlation coefficient and its square, it can be seen that R^2 the value of the square of the correlation coefficient is lesser than the actual value of the correlation coefficient.