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16/Eng06/055
ENG 382
Mechanical Engineering

Given $d = \alpha \beta^{t}$

Comparing with $y = mx + c$

$\log D = \log \alpha + t \log \beta$

where $a_0 = \log \alpha$ $\quad \log D = y$

$a_1 = \log \beta$ $\quad t = x$

$y = a_0 + a_1 x$

	$y = \log d$	$t = x$	xy	d (m)	x^2	y^2
1	0.30103	0	0	2	0	0.09061905
2	0.69897	1	0.69897	5	1	0.4885591
3	1.27875	2	2.55751	19	4	1.635211
4	1.69897	3	5.09691	50	9	2.886499
5	2.17898	4	8.71591	151	16	4.74794
6	2.672098	5	13.3605	410	25	7.140107
7	3.15685	6	18.94111	1435	36	9.9657
8	3.65437	7	25.5806	4512	49	13.3544
9	4.1118	8	32.8944	12936	64	16.9068993
10	4.61417	9	41.52695	41125	81	21.28997
11	5.0454	10	50.45405	111021	100	25.46113
	$\Sigma y = 29.4113$	55	199.8269		385	103.9620

$\Sigma y = 29.41133$

$\Sigma x = 55$

$\Sigma xy = 199.8264$

$\Sigma x^2 = 385$

$\Sigma y = a_0 N + a_1 \Sigma x$
$29.4113 = a_0 11 + a_1 55$

$\Sigma xy = a_0 \Sigma x + a_1 \Sigma x^2$
$119.8269 = a_0 55 + a_1 385$

$$a_0 = \frac{\begin{vmatrix} 29.4113 & 55 \\ 119.8269 & 385 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}} = \frac{29.4113(385) - 55(119.8269)}{11(385) - 55(55)}$$

$a_0 = 0.27511$

$$a_1 = \frac{\begin{vmatrix} 11 & 29.4113 \\ 55 & 119.8269 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}} = \frac{11 \times 119.8269 - (29.4113 \times 55)}{(11 \times 385) - 55(55)}$$

$a_1 = 0.47973$

Recall $a_0 = \log \alpha$
$\therefore \cancel{\alpha = 10^{0.47973} = 1.8841}$ $\alpha = 10^{0.27511} = 1.8841$

$a_1 = \log \beta$
$\beta = 10^{a_1} = 10^{0.47973} = 3.0181$

$\therefore \alpha = 1.8841$ and $\beta = 3.0181$

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Correlation Coefficient

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

$\cancel{(6 \times 16.849) - (11.696 \times 8.794)}$

$$R = \frac{(11 \times 199.82688) - 55(29.41133)}{\sqrt{(11 \times 385 - 55^2) \times [11 \times 103.9620 - (29.41133046)^2]}}$$

$R = 0.99984483l2$

$R_{square} = (0.9998448312)^2$
$= 0.9996897$

d) It can be observed that R^2 is less than R
$R^2 < R$ Therefore the square of the ~~Coefficient~~ correlation Coefficient is lesser than the actual value of the Correlation Coefficient.

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