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16/ENG06/057

Mechanical Engr.

ENG 382

Given $d = \alpha\beta^t$

Comparing eqn (1) to $y = mx + c$

$\log(1) = \log\alpha + t\log\beta$

Where $a_0 = \log\alpha$

$a_1 = \log\beta$

	$y = \log d$	$t = x$	xy	d (m)	x^2	y^2
1)	0.30102999.6	0	0	0	0	0.09061705
2)	0.698970004	1	0.698970004	1	1	0.48855907
3)	1.278753601	2	2.557507202	2	4	1.635210772
4)	1.698970004	3	5.096910013	3	9	2.886499096
5)	2.178976947	4	8.715907789	4	16	4.747940539
6)	2.672097858	5	13.36048929	5	25	7.140506982
7)	3.156851901	6	18.9411142	6	36	9.965713925
8)	3.654309091	7	25.58058854	7	49	13.354594
9)	4.111300007	8	32.89440056	8	64	16.35441345
10)	4.81416391	9	41.52695382	9	81	21.28997336
11)	5.045405135	10	30.4540535	10	100	25.45611297

$$\Sigma x = 55$$
$$\Sigma y = 29.4113046$$
$$\Sigma xy = 199.8288859$$
$$\Sigma x^2 = 385$$
$$\Sigma y^2 = 103.9820485$$

$$\Sigma y^2 = a_0 N + a_1 \Sigma x$$
$$29.41133046 = a_0(11) + a_1(55)$$

$$\Sigma xy = a_0 \Sigma x_1 + a_1 \Sigma x^2$$
$$1998268829 = a_0(55) + a_1(385) \text{ --- } (2)$$

~~Solving eqn (1) & eqn (2)~~

$$29.4113046 = 11a_0 + 55a_1 \text{ --- } (1)$$
$$199.8268839 = 55a_0 + 385a_1 \text{ --- } (2)$$

$$a_0 = \frac{\begin{vmatrix} 29.41133046 & 55 \\ 199.5268839 & 385 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}}$$

$$= \frac{(29.41133046)(385) - (55)(199.8268839)}{(11 \times 385) - (55 \times 55)}$$

$a_0 = 0.27511.$

$$a_1 = \frac{\begin{vmatrix} 11 & 29.4133546 \\ 55 & 199.828335 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}}.$$

$$a_1 = \frac{(11 \times 199.826835) - (29.4118846 \times 55)}{(11 \times 385) - (55 \times 55)}$$

$a = 0.47973$

$a_0 = \log \alpha$

$0.27511 = \log \alpha$

$\alpha = 1.841.$

$a_1 = \log \beta$

$0.47973 = \log \beta$

$\beta = 3.0181$

$\alpha = 1.8341 ; \beta = 3.0181$

d.) Correlation Coefficient.

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

$$R = \frac{11 \times 199.8268859) - 55(29.4133546)}{\sqrt{(11 \times 385 - 55^2) \times (11 \times 125 - 962.0804 - (29.4133}}$$

$R = 0.9998448312$,

$R_{square} = (0.99984431 2)^2 \Rightarrow 0.999688864$

For manual Method
$R = 0.999844312$.
$\hookrightarrow R = 0.9996898864$,

For Matlab;
$R = 0.9998$
$R^2 = 0.9997$.

For excel; $R = 0.99984483235963$
$R^2 = 0.99968966483792207$

ii) From observation for all the methods used to solve the correlation coefficient and it's square, it can be seen that $R^2 < R$ i.e. the value of the square of the correlation coefficient is less than the actual value of the correlation coefficient.