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Course Title: ENGINEERING MATHEMATICS IV

Assignment VI
Manual Solution

(a) $d = \alpha\beta^t$

where α & β are constants.

$\therefore \log d = \log\alpha + \log\beta^t$

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

by comparison to

$y = a_0 + a_1 x$

Since a_0 and a_1 are constants.

$\therefore \log\alpha = a_0$ and $\log\beta = a_1$

	x		y			
S/N	t(hr)	d(cm)	$\log d$	$x*y$	x^2	y^2
1	0	2	0.30102999	0	0	0.090619058
2	1	5	0.69897000	0.69897000	1	0.488559067
3	2	19	1.27875360	2.557507	4	1.635210777
4	3	50	1.69897000	5.09691001	9	2.886499076
5	4	151	2.17897614	8.715908	16	4.747940537
6	5	470	2.67209788	13.36049	25	7.140106962
7	6	1435	3.15685190	18.94111	36	9.965713925
8	7	4512	3.65436901	25.58058	49	13.35441345
9	8	12936	4.11180000	32.89444	64	16.92068995
10	9	41125	4.61405911	41.52695	81	21.28997336
11	10	111024	5.04546051^{35}_{0}	50.45405	100	25.45611217
Σ	55		29.41133046	199.8268839	385	103.9620485
$\bar{x}$						

$y = a_0 + a_1 x$

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

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

$\therefore 29.41133046 = 11 a_0 + 55 a_1$ —— (i)

$199.8268839 = 55 a_0 + 385 a_1$ —— (ii)

$147.0566523 = 55 a_0 + 275 a_1$ —— (iii)

$199.8268839 = 55 a_0 + 385 a_1$ —— (iv)

Eqn (iv) − Eqn (iii)

$52.77023167 = 110 a_1$

$a_1 = 0.47972937$

$205.8793132 = 77 a_0 + 385 a_1$ —— (v)

$199.8268839 = 55 a_0 + 385 a_1$ —— (vi)

Eqn (v) − Eqn (vi)

$6.052429243 = 22 a_0$

$a_0 = 0.27511042$

$\therefore y = 0.47972937 x + 0.27511042$

$\log \alpha = a_0$

$\alpha = 10^{a_0}$

$\alpha = 10^{0.27511042}$

$\alpha = 1.884128077$

$\alpha \simeq 1.8841$

$\log \beta = a_1$

$\beta = 10^{a_1}$

$\beta = 10^{0.479729371}$

$\beta = 3.018070487$

$\beta \simeq 3.0181$

d) i) $$R = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}}$$

$$R = \frac{(11 \times 199.8268839) - [55 \times 29.411330 46]}{\sqrt{(11 \times 385) - (55)^2} * [(11 \times 103.9820485) - (29411330 46)^2]}$$

$$R = 0.999844832$$

ii) $$R^2 = (0.999844832)^2$$

$$R^2 = 0.999689689$$

e) Since the value of the correlation coefficient R is between 0.8 and 1
Therefore data are highly correlative.