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16/ENG071008
Petroleum Engineering
ENG 382

t (hr)	0	1	2	3	4	5	6	7	8	9	10
d (m)	2	5	19	50	151	470	1435	4502	12936	41125	111781

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

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

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

$$y = a_0 + a_1 x$$

$$a_0 = \log \alpha$$

$$a_1 = \log \beta$$

$$y = \log d \quad x = t$$

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

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

y	x	xy	x ²	y ²
0.3010	0	0	0	0.09061
0.6990	1	0.6990	1	0.4886
1.2788	2	2.5576	4	1.6352
1.6990	3	5.097	9	2.8865
2.1799	4	8.7196	16	4.7479
2.6721	5	13.3605	25	7.1401
3.1569	6	18.9414	36	9.9657
3.6544	7	25.5808	49	13.3544
4.1118	8	32.8944	64	16.9069
4.6141	9	41.5269	81	21.28997
5.0454	10	50.454	100	25.4561

$$\sum y = 29.4124$$

$$\sum x = 55$$

$$\sum xy = 199.83$$

$$\sum x^2 = 385$$

$$\sum y^2 = 103.962$$

$$29.4124 = 1100 + 55\alpha$$

$$199.83 = 5520 + 385\alpha$$

Solving simultaneously

$$\alpha_0 = 0.2753$$

$$\alpha_1 = 0.4797$$

$$\alpha_0 = \log \alpha = 0.2753$$

$$\alpha = 10^{0.2753}$$

$$= 1.8850$$

$$\alpha_1 = \log \beta = 0.4797$$

$$\beta = 10^{0.4797}$$

$$= 3.0144$$

$$d = 1.885 (3.0144)^t$$

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

$$R = \frac{(11 \times 119.83) - (55)(29.4124)}{\sqrt{[(11 \times 385) - 55^2] \times [(11 \times 385) - (103962)^2]}}$$

$$R = 0.99984$$

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

For matlab

$$R = 0.9998$$

$$R^2 = 0.9997$$

For Excel

$$R_2 = 0.9998$$

$$R = 0.9996$$

d. From observation for all the methods used to solve the correlation and its 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.