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16/ENG07/011

Petroleum Engineering

ENG 382

Assignment 3

Solution

t (hr)	0	1	2	3	4	5	6	7	8	9
dcm)	2	5	19	50	151	470	1435	4512	12936	41025

20

111021

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

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

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

$$y = a_0 + a_1 x$$

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

$$y = a_0 + a_1 x$$

$$y x = a_0 x + a_1 x^2$$

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

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

y	x	xy	x <sup>2</sup>	y
0.3010	0	0	0	0.0908
0.6990	1	0.6990	1	0.4886
1.2788	2	2.5576	4	0.6352
1.6990	3	5.097	9	2.8665
2.1799	4	8.7196	16	4.7479
2.6721	5	13.3605	25	7.1401



3.1569	0	18.9414	36	9.9637
3.6542	4	25.5808	49	13.3544
4.1118	8	32.8974	64	16.9089
4.6141	9	41.5229	81	21.28997
5.0454	10	50.454	100	25.45617

$$\Sigma y = 29.4124$$

$$\Sigma x = 55$$

$$\Sigma xy = 199.83$$

$$\Sigma x^2 = 385$$

$$\Sigma y^2 = 103.92$$

$$29.4124 = 11d_0 + 55d_1$$

$$199.83 = 55d_0 + 385d_1$$

Solving Simultaneously

$$d_0 = 0.2753$$

$$d_1 = 0.4797$$

$$d_0 = \log K = 0.2753$$

$$K = 10^{0.2753}$$

$$K = 1.8850$$

$$d_1 = \log \beta = 0.4797$$

$$\beta = 10^{0.4797} = 3.0179$$

$$d = 1.885(3.0179)^t$$



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

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

$$R = 0.99984$$

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

For Matlab

$$R = 0.9998$$

$$R^2 = 0.9997$$

For Excel

$$R = 0.9998$$

$$R^2 = 0.9996$$

q) From observation for q1) 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.