Submitted by: Aasminpreet Singh Kainth

Steps Below Shows How I Have Completed Spreadsheet:

i. Calculate MTTF,

by applying the **Musa's Software Reliability growth models** on a data set which is computing MTTF values observed in a software system under test

$$MTBF = MTTF + MTTR$$
$$MTTF = MTBF - MTTR$$

Therefore, update the excel sheet for MTTF, by using the equation E7 = $B7-C7$ and copying the same to entire field.

ii. Computing the λ(τ),

We know that

$$MTTF = 1/\lambda$$

So, $\lambda = 1/MTTF$

Therefore, updating the field of λ(τ), by using the equation $G7=1/E7$. And copying the same for entire field.

iii. For estimating the value of θ,

we need to solve the following few equations:

$$\lambda(\tau) = \frac{\lambda_0}{\lambda_0 \cdot \theta \cdot \tau + 1}$$
$$\lambda_0 \cdot \theta \cdot \tau + 1 = \frac{\lambda_0}{\lambda(\tau)}$$
$$\lambda_0 \cdot \theta \cdot \tau = \frac{\lambda_0}{\lambda(\tau)} - 1$$
$$\theta \cdot \tau = \frac{1}{\lambda(\tau)} - \frac{1}{\lambda_0}$$
$$\theta = \frac{1}{\tau}[\frac{1}{\lambda(\tau)} - \frac{1}{\lambda_0}]$$

Updating the excel for θ and copying the entire field for 100 rows.

$$F7 = \frac{1}{D7} * [\frac{1}{G7} - \frac{1}{9}]$$

So, that changes are cascaded according to above functionality.

The estimated value of θ,

Take the average of θ of 100 rows, i.e., 0.015941.

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iv. For estimated value of λ(τ),

use θ from point d:

$$\lambda(\tau) = \frac{\lambda_0}{\lambda_0 \cdot \theta \cdot \tau + 1}$$

Where θ is the estimated value

Update the excel using below equations:

$$H7 = \frac{G\$7}{(G\$7 * 0.015941 * D7) + 1}$$

And, copy the same to entire field.

v. For $\lambda(\tau target)$=0.01,

We already know from Musa growth model,

$$\lambda(\tau) = \frac{\lambda_0}{\lambda_0 \cdot \theta \cdot \tau + 1}$$

Where, the τ is not yet known

λ_0 is 0.333333 (From the graph)

θ is 0.015941 (From previous calculations)

λ(τ) is 0.01

Therefore, by substituting the values in above equation:

$$0.01 = \frac{0.333333}{0.333333 \cdot 0.015941 \cdot \tau_{target} + 1}$$

$$0.333333 \cdot 0.015941 \cdot \tau_{target} + 1 = \frac{0.333333}{0.01} = 33.3333$$

$$0.333333 \cdot 0.015941 \cdot \tau_{target} = 32.3333$$

$$\tau_{target} = \frac{32.3333}{0.00531}$$

$$\tau_{target} = 6089.1337 \approx \mathbf{6089}$$

Therefore, the time at which the failure intensity reaches 0.01 is 6089.