come down gradually during the debugging process. However after analysing failure time data, decrasing trend in failure rate is not clearly seen. During debugging some new faults may be entering in software. Therefore residual number of bugs in the software is a random variable.

Let N(t) denote number of faults at time t (t>0), in the software then,

$$N(t) = \begin{cases} N & \text{when } 0 < t < t_1 \\ N_i & \text{when } t_i \leq t < t_{i+1} \end{cases}$$

where N number of bugs in the software at the begining and

$$N_i = \begin{cases} N_{i-1} - 1 & \text{if no fault is entered at time } t_i \\ N_{i-1} - 1 + k & \text{if } k \text{ faults are entered at time } t_i \end{cases}$$

$$k = 1,2,3,\ldots \;\; \& \;\; i = 1,2,3,\ldots$$

Therefore software reliability models having N(t) to be a random variable will be appropriate in various situation. Also inference in such models will be of great interest. In future, we try to study these types of models in detail.

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APPENDIX-A

Result : 1. Let $h(x) = e^{x} - 1 - x\,e^{(x/2)}$ for $x \geq 0$, then

a) $h(x)$ is monotonic increasing and non-negative function in x

b) $(e^{x} + e^{-x}) \geq (2+x^{2})$ for $x \geq 0$.

Proof : a) Consider,

$$h'(x) = \frac{d}{dx}\Big[h(x)\Big]$$

$$= e^{x} - [\, e^{(x/2)} + x\,(e^{(x/2)}/2)]$$

$$= e^{x} - [\, 1 + x/2 \,]\, e^{(x/2)}$$

$$= [\, e^{x/2} - 1 - x/2 \,]\, e^{(x/2)}$$

Since $e^{(x/2)} \geq [\, 1 + x/2 \,]$,

$$[\, e^{x/2} - 1 - x/2 \,] \geq 0$$

Hence, $h'(x) \geq 0$. Which shows that $h(x)$ defined above is a monotonic increasing function of x. To show it is non-negative consider,

$$\lim_{x \longrightarrow 0} h(x) = 0$$

which implies that $h(x)$ is non-negative function of x.

b) We have seen that $h(x)$ is monotonic increasing and non-negative function of x, that is, we have

$e^{x} - 1 - x\,e^{(x/2)} \geq 0$ for $x \geq 0$.

Thus for $x \geq 0$,

$$[e^{x} - 1] \geq x\,e^{(x/2)}$$

$$[e^{x} - 1]^{2} \geq x^{2}\,e^{x}$$

$$[e^{2x} - 2e^{x} + 1] \geq x^{2}\,e^{x}$$

$$[e^{x} - 2 + e^{-x}] \geq x^{2}$$

$$[e^{x} + e^{-x}] \geq [x^{2} + 2]$$

Hence the proof.

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