1 Simple fault tree for presentation

Elimination order: 3, 6, 5, 1, 2, 4

1.1 Factors

$\delta(x_2 - x_0)\theta(x_1 - x_4)\theta(x_2 - x_4) + \delta(x_4 - x_0)\theta(x_1 - x_4)\theta(x_4 - x_2) + \delta(x_4 - x_0)\theta(x_4 - x_1)$, $10e^{-10x_1}$, $\delta(x_3 - x_2)\theta(x_5 - x_3) + \delta(x_5 - x_2)\theta(x_3 - x_5)$, $40e^{-40x_3}$, $\delta(x_6 - x_4)\theta(x_5 - x_6) + \delta(x_5 - x_4)\theta(x_6 - x_5)$, $30e^{-30x_5}$, $40e^{-40x_6}$

1.2 Integration of x_3

$$\int_0^{+\infty} [\delta(x_3 - x_2)\theta(x_5 - x_3) + \delta(x_5 - x_2)\theta(x_3 - x_5)] \cdot 40e^{-40x_3} \mathrm{dx}_3 = \dots$$

Integration result $\dots = 40\theta(x_5 - x_2)e^{-40x_2} + \delta(x_5 - x_2)e^{-40x_2}$

1.3 Factors

$40\theta(x_5 - x_2)e^{-40x_2} + \delta(x_5 - x_2)e^{-40x_2}$, $\delta(x_2 - x_0)\theta(x_1 - x_4)\theta(x_2 - x_4) + \delta(x_4 - x_0)\theta(x_1 - x_4)\theta(x_4 - x_2) + \delta(x_4 - x_0)\theta(x_4 - x_1)$, $10e^{-10x_1}$, $\delta(x_6 - x_4)\theta(x_5 - x_6) + \delta(x_5 - x_4)\theta(x_6 - x_5)$, $30e^{-30x_5}$, $40e^{-40x_6}$

1.4 Integration of x_6

$$\int_0^{+\infty} [\delta(x_6 - x_4)\theta(x_5 - x_6) + \delta(x_5 - x_4)\theta(x_6 - x_5)] \cdot 40e^{-40x_6} \mathrm{dx}_6 = \dots$$

Integration result $\dots = 40\theta(x_5 - x_4)e^{-40x_4} + \delta(x_5 - x_4)e^{-40x_4}$

1.5 Factors

$40\theta(x_5 - x_4)e^{-40x_4} + \delta(x_5 - x_4)e^{-40x_4}$, $40\theta(x_5 - x_2)e^{-40x_2} + \delta(x_5 - x_2)e^{-40x_2}$, $\delta(x_2 - x_0)\theta(x_1 - x_4)\theta(x_2 - x_4) + \delta(x_4 - x_0)\theta(x_1 - x_4)\theta(x_4 - x_2) + \delta(x_4 - x_0)\theta(x_4 - x_1)$, $10e^{-10x_1}$, $30e^{-30x_5}$

1.6 Integration of x_5

$$\int_0^{+\infty} [40\theta(x_5 - x_4)e^{-40x_4} + \delta(x_5 - x_4)e^{-40x_4}] \cdot [40\theta(x_5 - x_2)e^{-40x_2} + \delta(x_5 - x_2)e^{-40x_2}] \cdot 30e^{-30x_5} \mathrm{dx}_5 = \dots$$

Integration result $\dots = 2800\theta(x_4 - x_2)e^{-40x_2 - 70x_4} + 2800\theta(x_2 - x_4)e^{-70x_2 - 40x_4} + 30\delta(x_4 - x_2)e^{-110x_2}$

1.7 Factors

$2800\theta(x_4 - x_2)e^{-40x_2 - 70x_4} + 2800\theta(x_2 - x_4)e^{-70x_2 - 40x_4} + 30\delta(x_4 - x_2)e^{-110x_2}$, $\delta(x_2 - x_0)\theta(x_1 - x_4)\theta(x_2 - x_4) + \delta(x_4 - x_0)\theta(x_1 - x_4)\theta(x_4 - x_2) + \delta(x_4 - x_0)\theta(x_4 - x_1)$, $10e^{-10x_1}$

1.8 Integration of x_1

$$\int_0^{+\infty} [\delta(x_2 - x_0)\theta(x_1 - x_4)\theta(x_2 - x_4) + \delta(x_4 - x_0)\theta(x_1 - x_4)\theta(x_4 - x_2) + \delta(x_4 - x_0)\theta(x_4 - x_1)] \cdot 10e^{-10x_1} \mathrm{dx}_1 = \dots$$

Integration result $\ldots = \delta(x_4 - x_0) - \delta(x_4 - x_0)e^{-10x_0} + \delta(x_4 - x_0)\theta(x_0 - x_2)e^{-10x_0} + \delta(x_2 - x_0)\theta(x_0 - x_4)e^{-10x_4}$

1.9 Factors

$\delta(x_4-x_0)-\delta(x_4-x_0)e^{-10x_0}+\delta(x_4-x_0)\theta(x_0-x_2)e^{-10x_0}+\delta(x_2-x_0)\theta(x_0-x_4)e^{-10x_4}$, $2800\theta(x_4-x_2)e^{-40x_2-70x_4}+2800\theta(x_2-x_4)e^{-70x_2-40x_4}+30\delta(x_4-x_2)e^{-110x_2}$

1.10 Integration of x_2

$\int_0^{+\infty}[\delta(x_4 - x_0) - \delta(x_4 - x_0)e^{-10x_0} + \delta(x_4 - x_0)\theta(x_0 - x_2)e^{-10x_0} + \delta(x_2 - x_0)\theta(x_0 - x_4)e^{-10x_4}] \cdot [2800\theta(x_4 - x_2)e^{-40x_2-70x_4} + 2800\theta(x_2 - x_4)e^{-70x_2-40x_4} + 30\delta(x_4 - x_2)e^{-110x_2}]\mathrm{dx}_2 = \ldots$

Integration result $\ldots = 2800\theta(x_0 - x_4)\theta(x_4 - x_0)e^{-40x_0-80x_4} + 70\delta(x_4 - x_0)e^{-70x_0} - 700\epsilon(x_4 - x_0)e^{-70x_0-50x_4} + 2800\theta(x_0 - x_4)e^{-70x_0-50x_4} - 40\delta(x_4 - x_0)e^{-120x_0}$

1.11 Factors

$2800\theta(x_0 - x_4)\theta(x_4 - x_0)e^{-40x_0-80x_4} + 70\delta(x_4 - x_0)e^{-70x_0} - 700\epsilon(x_4 - x_0)e^{-70x_0-50x_4} + 2800\theta(x_0 - x_4)e^{-70x_0-50x_4} - 40\delta(x_4 - x_0)e^{-120x_0}$

1.12 Integration of x_4

$\int_0^{+\infty}[2800\theta(x_0-x_4)\theta(x_4-x_0)e^{-40x_0-80x_4}+70\delta(x_4-x_0)e^{-70x_0}-700\epsilon(x_4-x_0)e^{-70x_0-50x_4}+2800\theta(x_0-x_4)e^{-70x_0-50x_4}-40\delta(x_4-x_0)e^{-120x_0}]\mathrm{dx}_4 = \ldots$

Integration result $\ldots = 126e^{-70x_0} - 96e^{-120x_0}$

1.13 More elimination?

Elimination order: 0

1.14 Factors

$126e^{-70x_0} - 96e^{-120x_0}$

1.15 Integration of x_0

$\int_0^{+\infty}[126e^{-70x_0} - 96e^{-120x_0}]\mathrm{dx}_0 = \ldots$

Integration result $\ldots = 1$

1.16 Results

$F(\infty) = 1$, $F(x_0) = 1 - \frac{9}{5}e^{-70x_0} + \frac{4}{5}e^{-120x_0}$, $MTTF = 1.905 \cdot 10^{-2}$

Evaluation of some points in distribution:

$F(1.000 \cdot 10^{-6}) = 3.000 \cdot 10^{-5}$

$F(5.000 \cdot 10^{-6}) = 1.500 \cdot 10^{-4}$

$F(1.000 \cdot 10^{-3}) = 3.123 \cdot 10^{-2}$