GLOSSARY OF THE GENERAL NOTATIONS AND ABBREVIATIONS

S : Set of all possible states of the system

E : Set of regenerative states

E : Complementary set of E i.e. set of non-regenerative states

q_{i,j}(\cdot), Q_{i,j}(\cdot) : p.d.f. and c.d.f. of one step or direct transition time from state \( S_i \in E \) to \( S_j \in E \).

P_{i,j} : Steady state transition probability from state \( S_i \) to \( S_j \) such that

\[ P_{i,j} = \lim_{t \to x} Q_{i,j}(t) = \int_0^\infty q_{i,j}(u) \, du \]

q^{(k)}_{i,j}(\cdot), Q^{(k)}_{i,j}(\cdot) : p.d.f. and c.d.f. of transition time from state \( S_i \in E \) to \( S_j \in E \) via non-regenerative state \( S_k \in \bar{E} \)

P^{(k)}_{i,j} : Steady state transition probability from state \( S_i \) to \( S_j \) via non-regenerative state \( S_k \) such that

\[ P^{(k)}_{i,j} = \lim_{t \to x} Q^{(k)}_{i,j}(t) = \int q^{(k)}_{i,j}(u) \, du \]

q^{(k,\cdot)}_{i,j}(\cdot), Q^{(k,\cdot)}_{i,j}(\cdot) : p.d.f. and c.d.f. of transition time from state \( S_i \in E \) to \( S_j \in \bar{E} \) via non-regenerative states \( S_k \in \bar{E} \) and \( S_l \in \bar{E} \).

P^{(k,\cdot)}_{i,j} : Steady state transition probability from state \( S_i \) to \( S_j \) via non-regenerative states \( S_k \) and \( S_l \) such that

\[ P^{(k,\cdot)}_{i,j} = \lim_{t \to x} Q^{(k,\cdot)}_{i,j}(t) = \int q^{(k,\cdot)}_{i,j}(u) \, du \]

Q_{i,j,y} : Conditional p.d.f. and c.d.f. of transition time
from state $S_i$ to $S_j$ given that the system entered after a Sojourn for time $x$ in the preceding state.

$P_{i,j|\lambda}$ : Steady state transition probability of the transition from $S_i$ to $S_j$ given that the system entered in state $S_i$ at epoch $x$.

$$P_{i,j|\lambda} = \lim_{t \to \infty} Q_{i,j|\lambda}(t) = \int q_{i,j|\lambda}(u)\,du$$

$q^{(k)}_{i,j|\lambda}(\cdot), Q^{(k)}_{i,j|\lambda}(\cdot)$ : Conditional p.d.f. and c.d.f. of transition time from state $S_i$ to $S_j$ via non-regenerative state $S_k$ given that the system entered after a Sojourn per time $x$ in the proceeding state.

$p^{(k)}_{i,j|\lambda}$ : Steady state transition probability of the transition from $S_i$ to $S_j$ via non-regenerative state $S_k$ given that the system entered in state $S_i$ at epoch $x$.

$$p^{(k)}_{i,j|\lambda} = \lim_{t \to \infty} Q^{(k)}_{i,j|\lambda}(t) = \int q^{(k)}_{i,j}(u)\,du$$

$\phi(t)$ : c.d.f. of the first passage time from regenerative state $S_i$ to $S_j$ a failed state

$A_i(t)$ : Probability that system is in up state at instant $t$ given that the system entered regenerative state $S_i$ at $t = 0$.

$M_i(t)$ : Probability that system up initially in regenerative state $S_i$ at time $t$ without passing through any other regenerative state or returning to itself through one or more non-regenerative states.
\( B_i(t) \) : Probability that the repairman is busy at instant 
to, given that the system started from 
regenerative state \( S_i \) at \( t = 0 \).

\( B_{IR}(t) \) : Probability that the repairman is busy in 
replacing failed unit at instant \( t \), given that the 
system entered regenerative state \( S_i \) at \( t = 0 \).

\( W_i(t) \) : Probability that the repairman is busy in 
regenerative state \( S_i \) at time \( t \) without passing 
through any other regenerative state.

\( RP_i(t) \) : expected number of replacements in \((0, t]\), given 
that the system started from regenerative state \( S_i \) 
at \( t = 0 \).

\( V_i(t) \) : expected number of visits by the repairman in \((0, t]\), given 
that the system started from the 
regenerative state \( S_i \) at \( t = 0 \).

\( \mu_x \) : Mean Sojourn time in state \( S_i \) given that the unit 
under repair in state \( S_i \) entered into F-mode after 
an operation of time \( x \).

\( \mu_i \) : Mean sojourn time in state \( S_i \) before transiting to 
any other state.

\( m_{i,j}, m_{h,j}^{(k)} \) : Contribution to mean sojourn time in 
regenerative state \( S_i \) without visiting to any other 
state, visiting state \( k \) only once.

\( C/P \) : Expected total cost/profit incurred in \((0, t)\)

\( * \) : Symbol for Laplace Transform.
e.g., \( f^*(s) = \int_0^\infty e^{-st} f(t)dt \)

** : Symbol for Laplace-Stieltjes transform,

e.g. \( F^{**}(s) = \int_0^\infty e^{-st} d F(t) \)

\( \odot \) : Symbol for Laplace Convolution,

e.g. \( f(t) \odot g(t) = \int_0^t f(u) g(t-u)du \)

\( \ast \) : Symbol for Stieltjes convolution,

e.g. \( F(t) \ast G(t) = \int_0^1 G(t-u) d F(u) \)

L.T. : Laplace Transform

L.S.T. : Laplace Stieltjes Transform