

AN IMPROVED DC LOAD FLOW TECHNIQUE FOR

RELIABILITY STUDIES OF POWER SYSTEMS

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A dissertation submitted to

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LIST OF SYMBOLS

- $\alpha, \beta$  - deterministic vectors which distribute the system load to individual buses.
- B - susceptance of series element of transmission line (i,k)
- D - number of days of study
- $d_j$  - mean duration of a contingency state
- e - mean duration of system load being in a peak state
- $E_i = V_i e^{j\theta_i}$  - complex voltage at node i
- $E_i^*$  - complex conjugate of voltage  $E_i$
- erf - the error function
- exp - exponent
- $I_i$  - current through line (i,k) at node i
- i,k - node identification
- j - complex operator
- Lc<sub>j</sub> - critical load of a contingency network state
- $L_i$  - system load being in a peak state
- $L_o$  - system load being in a low state
- $\lambda$  - failure rate of a component
- $\mu$  - repair rate of a component
- $\theta_{ik}$  - voltage angle difference between nodes i and k, ( $\theta_i - \theta_k$ )
- $\theta_i$  - voltage angle at node i (reference to slack node)

- $N$  - duration of normal weather  
 $N_j$  - contingency state of a transmission network  
 $N_0$  - normal state of a transmission network  
 $P_i$  - real power flow in line (i,k) at node i  
 $Pr$  - probability  
 $P_{mn}^{pq}$  - the probability of overload of line mn due to line pq being out of service  
 $Q_i$  - reactive power flow in line (i,k) at node i  
 $Q_m$  - modified reactive power in line (i,k)  
 $q$  - reactive power generated in line (i,k)  
 $\rho$  - random variable for system load  
 $r_{ik}$  - series resistance of line (i,k)  
 $R$  - sensitivity factor  
 $S_i$  - complex power flow in line (i,k) at node i, ( $S_i = P_i - jQ_i$ )  
 $V_i$  - voltage magnitude at node i  
 $x_{ik}$  - series reactance of line (i,k)  
 $\hat{x}_{ik}$  - inverse of the series susceptance of line (i,k), ( $\hat{x}_{ik} = \frac{1}{B}$ )  
 $y_{ik}^{sh}$  - shunt susceptance of line (i,k)  
 $z_{ik}$  - series impedance of line (i,k),  $z_{ik} = (r_{ik} + jx_{ik})$



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