

# List of symbols

$\rho$	Air density
$C_P$	Power coefficient of the wind turbine
$\lambda$	Tip-speed ratio of the wind turbine
$\theta$	Blade-pitch angle of the wind turbine
$\lambda_1, C_1, C_2, C_3, C_4, C_5, C_6$	Wind turbine Constants
$\omega$	Generator-turbine rotor speed
$\tau_{tg}$	Generator-turbine time constant
$\tau_a$	Stepper motor time constant
$\tau_{as}$	Stepper motor-RS time constant
$D$	Duty ratio of DC/DC type-A chopper
$V_g$	Generator output phase voltage
$V_o$	Maximum generator output phase voltage
$V_{SS}$	Generator output phase voltage of RS
$V_{RS}$	Generator output phase voltage of SS
$V_D$	Voltage across diode
$V_S$	Solar panel no-load voltage
$P_W$	Stator displacement angle in electrical degree
$T_t$	Wind turbine torque
$I_a$	DC-motor armature current

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$I_f$	DC-motor field current
$r_a$	DC-motor armature resistance
$V_m$	DC-motor armature voltage
$K_e$	DC-motor voltage constant
$K_t$	DC motor torque constant
$T_g$	Generator electromagnetic torque
$J_{tg}$	Generator-turbine inertia
$f_{tg}$	Generator-turbine viscous friction force coefficient
$K_g$	Generator voltage constant
$R_L$	Load resistance
$V_{dc}$	DC-link voltage
$L_g$	Generator leakage reactance
$r$	Wind turbine blade radius
$i_g$	Generator phase current
$R_g$	Generator phase resistance
$i_L$	Load current
$i_C$	DC-link capacitor branch current
$C$	DC-link capacitor
$V_a$	Stepper motor external supply
$L_a, R_a$	Stepper motor per phase leakage inductance and resistance
$f_{as}$	Stepper motor-RS viscous friction force coefficient
$P_g$	Generator output power
$a_o, a_1, b_1, c_1, d_1$	Constants
$k_{dg}, k_{dh}, k_{ng}, k_{nh}$	Constants
$V_{ref}$	DC-link reference voltage

$V_{dip}$	Voltage by which grid voltage dips at grid-fault
$P_S$	Solar panel generated power