function [sys, x0, str, ts] = windvel (t, x, u, flag, t1, t2, t3, t4, k1, k2, k3)

switch flag,
    % Initialization %
    case 0,
      [sys, x0, str, ts] = mdlInitializeSizes;
    % Outputs %
    case 3,
      sys = mdlOutputs (t, x, u, t1, t2, t3, t4, k1, k2, k3);
    case {1, 2, 4, 9}
      sys = [ ];
    otherwise
      error ( [ 'Unhandled flag = ', num2str (flag) ] );
end

%==========================================================================
% mdlInitializeSizes
% Return the sizes, initial conditions, and sample times for the s – function.
%==========================================================================
% function [sys, x0, str, ts] = mdlInitializeSizes

sizes = simsizes;
sizes.NumContStates = 0;
sizes.NumDiscStates = 0;
sizes.NumOutputs = 1;
sizes.NumInputs = 0;
sizes.DirFeedthrough = 0;
sizes.NumSampleTimes = 1; % at least one sample time is needed

sys = simsizes(sizes);

% % initialize the initial conditions
%x0 = [ ];

% % str is always an empty matrix
%str = [ ];

% % initializes the array of sample times
%ts = [0 0];

% %==========================================================
% mdlOutputs
% Return the block outputs.
%==========================================================
%function sys = mdlOutputs (t, x, u, t1, t2, t3, t4, k1, k2, k3)

if (t < t1)
sys = k1;
elseif ((t >= t1) & (t <= t2))
T = cos (pi * (t - t1) / (t2 - t1));
sys = (k1 + k2 * (1 – abs (T)));
elseif ((t > t2) & (t < t3))
sys = k1;
elseif ((t >= t3) & (t <= t4))
m = k3 / (t4 – t3);
sys = (k1 + m * (t – t3));
elseif (t > t4)
sys = (k1 + k3);
end

% end mdlOutputs
APPENDIX 2

IMPLEMENTATION OF THE INDUCTION MACHINE MODEL IN SIMULINK

Figure A2.1 Implementation of the Induction Machine Model in Simulink
APPENDIX 3

SIMULINK MODEL OF THE PITCH CONTROLLED GENERATOR (12 KW)

vphase=230
wind velocity=15
beta=0
gamma=17.64
pw=40kw
pm=pe=12kw
cp=0.3
current=52A
Tm=6.49

Figure A3.1 Simulink Model of the Pitch Controlled Generator (12 KW)
APPENDIX 4

SIMULINK MODEL OF THE ROTOR RESISTANCE CONTROLLED GENERATOR (12 KW)

Figure A4.1 Simulink Model of the Rotor Resistance Controlled Generator (12 KW)
APPENDIX 5

SIMULINK MODEL OF THE DOUBLY FED INDUCTION GENERATOR (12 KW)

Figure A5.1 Simulink Model of the Doubly Fed Induction Generator (12 KW)
APPENDIX 6

PITCH CONTROLLED GENERATOR (12 KW) BY VARIFYING THE RESULT OPTIMIZATION TECHNIQUE

FINAL CONTROL VARIABLES

Wind Velocity Pitch angle
(Vw) (Beta)
13.56222 4.27138

FINAL FITNESS VALUES
WIND POWER POWER CAPTURE POWER POWER COEFFICIENT BY TURBINE DIFFERENCE
(Pw) (Cp) (Pe) (Pref-Pe)

29565.0881 0.4059 12000.046 0.046
Elapsed time is 0.504227 seconds.

Figure A6.1 Pitch Controlled Generator (12 KW) Result For Optimization of Power Difference
APPENDIX 7

ROTOR RESISTANCE CONTROLLED GENERATOR
(12 KW) BY VERIFYING THE RESULT
OPTIMIZATION TECHNIQUE

FINAL CONTROL VARIABLES
Rotor Resistance stator Resistance
(R1) (R2)
0.05000 0.00001

FINAL FITNESS VALUES
Electrical POWER CAPTURE POWER
Torque BY TURBINE DIFFERENCE
(Te) (Pe) (Pref-Pe)

6.6667 12000.088 0.088
Elapsed time is 2.489844 seconds.

Figure A7.1 Rotor Resistance Controlled Generator (12 KW) Result For Optimization of Power Difference
APPENDIX 8

DOUBLY FED INDUCTION GENERATOR (12 KW) BY VARIFYING THE RESULT OPTIMIZATION TECHNIQUE

FINAL CONTROL VARIABLES
Rotor current
(Ir)
24.14487

FINAL FITNESS VALUES
Electrical POWER CAPTURE POWER
Torque BY TURBINE DIFFERENCE
(Te) (Pe) (Pref-Pe)
6.6667 12000.001 0.001
Elapsed time is 14.264558 seconds.

Figure A8.1 Doubly Fed Induction Generator (12 KW) Result For Optimization of Power Difference