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LIST OF SYMBOLS AND ABBREVIATIONS

α	Momentum factor in BPN
Γ	A constant used in conventional MRAS
δ	Product of learning factor and weight
Δe	Change in error
Δv	Change in voltage
Δw	Change in weight
η	Learning factor in BPN
Θ	Slanting angle of conical tank
Θ_1	Controller parameter in conventional MRAS
Θ_2	Controller parameter in conventional MRAS
Σ	Summation symbol
τ	Time constant of the process
Π	Product symbol
A	Halfwidth of the membership function
A(h)	Area of cross section of tank at any height 'h'
ADAM	Analog to digital, digital to analog module
ANFIS	Adaptive neuro fuzzy inference system
ANN	Artificial neural network
b	Outlet valve coefficient
B	Slope of the membership function at cross over point
BPN	Backpropagation
C	Centre of the membership function
Cm	Centimeter
DP	Dynamic programming
e	error

E_{ss}	Steady state error
F_{in}	Inflow rate into the tank
F_{insp}	Final set point
FIS	Fuzzy inference system
FLC	Fuzzy logic controller
F_{opt}	Optimum flow
F_{out}	Outflow rate from the tank
GS	Gain scheduling
H	Total height of the tank
$h(t)$	level at any time 't'
h_m	Measured output
IAE	Integral absolute error
$Inisp$	Initial set point
ISE	Integral square error
ITAE	Integral time absolute error
J	Performance index in time optimal control
K	Process steady state gain
K_c	Proportional gain of conventional controller
K_d	Derivative gain of conventional controller
K_i	Integral gain of conventional controller
MLP	Multi layer perceptron
MO	Model output
MRAS	Model reference adaptive system
NL	Negative large
NNTOOL	Neural network toolbox
NS	Negative small
P	Consequent parameter in ANFIS
P_f	Final valve position
P_i	Initial valve position
PL	Positive large

P_{opt}	Optimum valve position
PRC	Process reaction curve
PS	Positive small
Q	Consequent parameter in ANFIS
r	Radius of the tank at any height 'h'
R	Top radius of the tank
$r(t)$	Reference trajectory in time optimal control
RBF	Radial basis functions
RMSE	Root mean square error
S	laplace operator
SP	Set point
t_1	close command in time optimal control
t_d	Process deadtime
t_r	Open command in time optimal control
t_m	minimum time in time optimal control
u	Control variable
u_c	Control variable in the process model used in MARS
w_{ij}	Weights from input layer to hidden layer
w_{jk}	Weights from hidden layer to output layer
z	Control command in time optimal control
Z	Zero
ZN-PID	Conventional Ziegler and Nichols PID