# LIST OF SYMBOLS AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>SYMBOLS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A_i$</td>
<td>Area of the inlet channel</td>
</tr>
<tr>
<td>$A_r$</td>
<td>X- Sectional area of the vortex basin</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>Factor of proportionality</td>
</tr>
<tr>
<td>$\alpha_o$</td>
<td>Factor of proportionality</td>
</tr>
<tr>
<td>$B_c$</td>
<td>Bed width of the inlet channel</td>
</tr>
<tr>
<td>$B$</td>
<td>Bed width of the inlet channel</td>
</tr>
<tr>
<td>$c$</td>
<td>Non-dimensional concentration</td>
</tr>
<tr>
<td>$c$</td>
<td>Concentration in parts per million</td>
</tr>
<tr>
<td>$C_i$</td>
<td>Concentration in parts per million at inlet of settling basin</td>
</tr>
<tr>
<td>$c_f$</td>
<td>Free vortex constant</td>
</tr>
<tr>
<td>$c_\infty$</td>
<td>Concentration at infinity</td>
</tr>
<tr>
<td>$d$</td>
<td>Diameter of the inlet pipe</td>
</tr>
<tr>
<td>$D$</td>
<td>Diameter of the overflow chamber</td>
</tr>
<tr>
<td>$D_T$</td>
<td>Diameter of the vortex-settling basin</td>
</tr>
<tr>
<td>$d_{50}$</td>
<td>Median size of the sediment particles</td>
</tr>
<tr>
<td>$d_o$</td>
<td>Rate of deposition of sediment on the bottom of the vortex settling basin</td>
</tr>
<tr>
<td>$d_u$</td>
<td>Diameter of the under flow outlet orifice</td>
</tr>
<tr>
<td>$E_D$</td>
<td>Error function</td>
</tr>
<tr>
<td>$E_\omega$</td>
<td>Regularization</td>
</tr>
<tr>
<td>$e_o$</td>
<td>Rate of entrainment of the sediment from bottom of vortex settling basin</td>
</tr>
<tr>
<td>$f$</td>
<td>Dimensionless stream function</td>
</tr>
<tr>
<td>$F(\omega)$</td>
<td>Energy function</td>
</tr>
<tr>
<td>$g$</td>
<td>Gravitational acceleration</td>
</tr>
<tr>
<td>$h$</td>
<td>Height of the overflow crest</td>
</tr>
</tbody>
</table>
$H_T$ = Overall height of the vortex settling basin

$h_1$ = Height of diaphragm

$h_2$ = Basin depth at its periphery from inlet canal

$h_c$ = Depth of flow in the inlet canal

$h_f$ = Head loss between inlet and outlet channel

$h_i$ = Depth of flow at entrance of the vortex settling basin

$h_o$ = Depth of flow in overflow outlet channel

$h_p$ = Depth of flow at the periphery of the vortex settling basin

$h_t$ = Total head (static head plus velocity head)

$h_u$ = Depth of flow at the center of the underflow outlet

$\Delta H$ = Differential head

$K$ = Discharge weighing coefficient

$K_o$ = A coefficient

$K_1$ = Sediment mobility factor

$l$ = Mixing length

$n$ = Ratio of tangential velocity to axial velocity

$n_i, n_j, n_k$ = Total number of computational nodes along $r, \theta$ and $z$ directions

$o_i$ = Network output for $i$-th output

$p$ = Pressure intensity

$ppm$ = Parts per million

$q$ = Through flow rate

$Q$ = Inflow

$Q_d$ = Design discharge

$Q_i$ = Discharge in inlet channel

$Q_o$ = Discharge in overflow outlet channel

$Q_u$ = Discharge through underflow outlet

$Q_u/Q_i$ = Water abstraction ratio
\( Q_w \) = Weighted discharge
\( R \) = Dimensionless radial spacing
\( R_b \) = Dimensionless radius of the basin
\( R_l \) = Characteristics length
\( R_f \) = Radius of the vortex settling basin
\( r_i \) = Dimensionless radius
\( r_c \) = Radial distance where free and forced vortices coincide
\( r_o \) = Radius of air-core
\( r_m \) = Radius of maximum velocity
\( r_o \) = Radius of orifice
\( S_f \) = Bottom slope of the vortex settling basin
\( t_i \) = Target for \( i \)-th output
\( U_* \) = Shear velocity in inlet channel
\( V_c \) = Average velocity in the inlet channel
\( V_i \) = Average velocity at the inlet of the vortex settling basin
\( V_u \) = Velocity of flow through underflow outlet
\( V_r, V_\theta, V_z \) = Dimensionless velocity components along radial, tangential and vertical directions
\( V_{to} \) = Maximum tangential velocity
\( v \) = Velocity of flow at any point in the flow field
\( v_e \) = Limit velocity in radial direction
\( v_s \) = Velocity component along tangential direction
\( v_y \) = Velocity component along radial direction
\( v_r, v_\theta, v_z \) = Components of the velocity along radial, tangential and vertical directions
\( v_{to} \) = Maximum tangential velocity at \( r = r_o \)
\( W \) = Upward velocity at the centre of the vortex settling basin
\( x \) = Variable
\( x_{\text{max}} \) = Maximum value of \( x \)
\( x_{\text{min}} \) = Minimum value of \( x \)
\( x_n \) = Normalized value of \( x \)
\( Z \) = Non-dimensional vertical coordinate
\( z \) = Depth in the basin measured from the bottom of basin
\( z_i \) = Axial co-ordinate downward positive
\( Z_h \) = Difference between the bed levels of vortex settling basin and overflow outlet channels

**GREEK LETTERS**

\( \alpha \) = Weighting coefficient
\( \beta_o \) = Constant
\( \kappa \) = Mixing length coefficient or Karman's constant
\( \varepsilon \) = Eddy viscosity
\( \varepsilon_D \) = Dimensionless eddy kinematic viscosity
\( \varepsilon_i \) = Apparent eddy kinematic viscosity
\( \phi \) = Local dissipation function
\( \psi \) = Stream function
\( \varepsilon_r, \varepsilon_\theta, \varepsilon_z \) = Diffusion coefficients along \( r, \theta \) and \( z \) directions
\( \varepsilon_R, \varepsilon_\Theta, \varepsilon_Z \) = Non-Dimensional Diffusion coefficients along \( r, \Theta \) and \( Z \) directions
\( \gamma_f \) = Specific weight of fluid
\( \gamma_s \) = Specific weight of sediment
\( \eta \) = Constant
\( \eta_c \) = Computed sediment removal efficiency
\( \eta_0 \) = Efficiency of sediment removal
\( \nu \) = Kinematic viscosity
\( \nu_e \) = Effective viscosity = \( \nu + \varepsilon \)
\( \pi \) = Constant
\( \rho_f \) = Mass density of fluid

\( \rho_s \) = Mass density of sediment

\( \omega \) = Angular velocity of forced vortex

\( \omega_f \) = Characteristic frequency

\( \omega_q \) = Weight of the connection joining the \( j \)-th neuron in a layer with \( i \)-th neuron in the previous layer

\( \omega_a \) = Fall velocity of the sediment particle

\( \Gamma \) = Circulation parameter

\( \Omega \) = Vorticity

\( \Omega_D \) = Non-dimensional vorticity

\( r, \theta, z \) = Cylindrical polar co-ordinate system

\( \delta r, \delta \theta, \delta z \) = Increments along \( r, \theta, z \) directions

\( \Delta R, \Delta \theta, \Delta Z \) = Size of computational grid

**ABBREVIATION**

AIAA American Institute of Aeronautics and Astronautics

APWA American Public Works Association

ASCE American Society of Civil Engineers

IAHR International Association for Hydraulics Research

ICID International Commission on Irrigation and Drainage

ISH Indian Society for Hydraulics

JHD Journal of Hydraulic Division

JHE Journal of Hydraulic Engineering

JHR Journal of Hydraulic Research

JICE Journal of Institution of Civil Engineers

JURP The Journal of Undergraduate Research in Physics

UWJ Urban Water Journal

JFAS Journal of Fisheries and Aquatic Science

JID Journal of Irrigation and Drainage

JIWRS Journal of Indian Water Resources Society

IWRS Indian Water Resources Society