NOMENCLATURE

\[ r, \theta, z \text{ or } r, \varphi, z \]  
Cylindrical co-ordinates,

\[ r, \theta, \varphi \]  
Spherical polar co-ordinate,

\[ x, y, z \]  
Cartesian coordinates,

\[ u_r, u_\theta, u_z \]  
Displacement components in cylindrical co-ordinates.

\[ u, v, w \]  
Components of displacements,

\[ w_0 \]  
Initial deflection,

\[ w_i \]  
Additional deflection,

\[ w = (w_0 + w_i) \]  
Total deflection,

\[ \omega \]  
Angular velocity,

\[ \Omega \]  
Frequency,

\[ h \]  
Thickness of a plate or a shell,

\[ \varphi \]  
Stress function,

\[ D \]  
Flexural rigidity,

\[ D_r \]  
Radial flexural rigidity,

\[ D_\theta \]  
Tangential flexural rigidity,

\[ D_s, D_\sigma, D_\nu \]  
Extensional rigidities,

\[ q \]  
Intensity of a continuously distributed load,

\[ M_r \]  
Radial bending moment,

\[ M_t \]  
Tangential bending moment,
\( M_x, M_\varphi \)  
Bending moments,

\( M_{x\varphi}, M_{\varphi x} \)  
Twisting moments,

\( P \)  
Uniform pressure,

\( P_r \)  
Uniform normal pressure on the wall of a shell,

\( Q_r \)  
Radial shearing force,

\( \nu \)  
Poisson’s ratio,

\( \nu_\theta \)  
Poisson’s ratio in the transverse direction,

\( \rho, \bar{\rho} \)  
Density of the material,

\( t \)  
Time,

\( T \)  
Temperature,

\( E \)  
Young’s modulus,

\( E_r, E_\theta \)  
Modulus of elasticity in radial and transverse direction respectively,

\( E_1, E_2, E_\nu, E_{ij} \)  
Moduli of elasticity,

\( K \)  
Thermal conductivity,

\( G \)  
Shear modulus,

\( H \)  
Rate of heat generation,

\( N \)  
Force of compression,

\( \alpha, \alpha_i \)  
Coefficients of thermal expansion,

\( \sigma_{rr}, \sigma_{\theta\theta}, \sigma_{zz}, \sigma_{r\theta}, \sigma_{\theta z}, \sigma_{zr} \)  
Stress components,

\( \sigma_r, \sigma_\varphi, \tau_{r\varphi} \)  

\( \varepsilon_{rr}, \varepsilon_{\theta\theta}, \varepsilon_{zz}, \varepsilon_{r\theta}, \varepsilon_{\theta z}, \varepsilon_{zr} \)  
Strain components,

\( \varepsilon_r, \varepsilon_\varphi, \gamma_{r\varphi} \)  

\[ N_x, \quad N_\phi \] \quad Normal \ forces \ per \ unit \ length,

\[ N_{x\phi}, \quad N_{\phi x} \] \quad Shearing \ forces,

\[ K_x, \quad K_\phi, \quad K_v \] \quad Bending \ rigidities,

\[ K_{x\phi} \] \quad Twisting \ rigidity.