

## Appendix

$$A_{ij} = \sum_{k=1}^n \left( Q_{ij}^k \right)_k (h_k - h_{k-1}), \quad (i, j) = (1, 2, 6);$$

$$B_{ij} = \frac{1}{2} \sum_{k=1}^n \left( Q_{ij}^k \right)_k (h_k - h_{k-1}), \quad (i, j) = (1, 2, 6).$$

$$H_{ij} = \sum_{k=1}^n \left( Q_{ij}^k \right)_k (h_k - h_{k-1}); \quad (i, j) = (4, 5);$$

$$D_{ij} = \frac{1}{3} \sum_{k=1}^n \left( Q_{ij}^k \right)_k (h_k - h_{k-1}); \quad (i, j) = (1, 2, 6).$$

$$A_{11}^* = \frac{A_{22}A_{66} - A_{26}^2}{\Delta}, \quad A_{12}^* = \frac{A_{16}A_{26} - A_{12}A_{66}}{\Delta}, \quad A_{16}^* = \frac{A_{12}A_{26} - A_{22}A_{16}}{\Delta},$$

$$A_{22}^* = \frac{A_{11}A_{66} - A_{16}^2}{\Delta}, \quad A_{26}^* = \frac{A_{12}A_{16} - A_{11}A_{26}}{\Delta}, \quad A_{66}^* = \frac{A_{11}A_{22} - A_{12}^2}{\Delta},$$

$$A_{22}^* = \frac{A_{11}A_{66} - A_{16}^2}{\Delta}, \quad A_{26}^* = \frac{A_{12}A_{16} - A_{11}A_{26}}{\Delta}, \quad A_{66}^* = \frac{A_{11}A_{22} - A_{12}^2}{\Delta},$$

$$\Delta = A_{11}A_{22}A_{66} - A_{11}A_{26}^2 + 2A_{12}A_{16}A_{26} - A_{12}^2A_{66} - A_{16}^2A_{22},$$

$$B_{11}^* = A_{11}^*B_{11} + A_{12}^*B_{12} + A_{16}^*B_{16}, \quad B_{12}^* = A_{11}^*B_{12} + A_{12}^*B_{22} + A_{16}^*B_{26},$$

$$B_{16}^* = A_{11}^*B_{16} + A_{12}^*B_{26} + A_{16}^*B_{66}, \quad B_{21}^* = A_{12}^*B_{11} + A_{22}^*B_{12} + A_{26}^*B_{16},$$

$$B_{22}^* = A_{12}^*B_{12} + A_{22}^*B_{22} + A_{26}^*B_{26}, \quad B_{26}^* = A_{12}^*B_{16} + A_{22}^*B_{26} + A_{26}^*B_{66},$$

$$B_{61}^* = A_{16}^*B_{11} + A_{26}^*B_{12} + A_{66}^*B_{16}, \quad B_{62}^* = A_{16}^*B_{12} + A_{26}^*B_{22} + A_{66}^*B_{26},$$

$$B_{66}^* = A_{16}^*B_{16} + A_{26}^*B_{26} + A_{66}^*B_{66}.$$

$$D_{11}^* = A_{11}^*A_{11} + A_{12}^*A_{12} + A_{16}^*A_{16}, \quad D_{12}^* = A_{11}^*A_{12} + A_{12}^*A_{22} + A_{16}^*A_{26},$$

$$D_{21}^* = A_{12}^*A_{11} + A_{22}^*A_{12} + A_{26}^*A_{16}, \quad D_{22}^* = A_{12}^*A_{12} + A_{22}^*A_{22} + A_{26}^*A_{26},$$

$$D_{16}^* = A_{16}^*A_{11} + A_{26}^*A_{12} + A_{66}^*A_{16}, \quad D_{26}^* = A_{16}^*A_{12} + A_{26}^*A_{22} + A_{66}^*A_{26}.$$

$$A_1 = \frac{(W + 2\mu h)W\alpha^2\beta^2}{32A_{22}^*\alpha^4}, \quad A_2 = \frac{(W + 2\mu h)W\alpha^2\beta^2}{32A_{11}^*\beta^4},$$

$$A_3 = \overline{B_{11}}W + \overline{B_{12}}\Phi_x + \overline{B_{13}}\Phi_y, \quad A_4 = \overline{B_{21}}W + \overline{B_{22}}\Phi_x + \overline{B_{23}}\Phi_y,$$

$$\overline{T_{11}} = \left[ A_{11}^* \beta^4 + A_{22}^* \alpha^4 + (2A_{12}^* + A_{66}^*) \alpha^2 \beta^2 \right], \overline{T_{12}} = \left[ 2A_{16}^* \beta^3 \alpha + 2A_{26}^* \alpha^3 \beta \right],$$

$$\overline{T_{13}} = \left[ (B_{11}^* - B_{66}^*) \alpha \beta^2 + B_{21}^* \alpha^3 \right], \overline{T_{14}} = \left[ B_{12}^* \beta^3 + (B_{22}^* - B_{66}^*) \beta \alpha^2 \right],$$

$$\overline{T_{21}} = \left[ 2A_{16}^* \beta^3 \alpha + 2A_{26}^* \alpha^3 \beta \right], \overline{T_{22}} = \left[ A_{11}^* \beta^4 + A_{22}^* \alpha^4 + (2A_{12}^* + A_{66}^*) \alpha^2 \beta^2 \right],$$

$$\overline{T_{23}} = - \left[ B_{16}^* \beta^3 + (B_{26}^* - B_{16}^*) \alpha^2 \right], \overline{T_{24}} = - \left[ (B_{16}^* - B_{26}^*) \alpha \beta^2 + B_{26}^* \alpha^3 \right],$$

$$*\overline{B_{11}} = \frac{\overline{T_{22}} \alpha_m^2}{(\overline{T_{11}} \overline{T_{22}} - \overline{T_{21}} \overline{T_{12}}) R}, \overline{B_{12}} = \frac{(\overline{T_{13}} \overline{T_{22}} - \overline{T_{12}} \overline{T_{23}})}{(\overline{T_{11}} \overline{T_{22}} - \overline{T_{21}} \overline{T_{12}})}, \overline{B_{13}} = \frac{(\overline{T_{14}} \overline{T_{22}} - \overline{T_{12}} \overline{T_{24}})}{(\overline{T_{11}} \overline{T_{22}} - \overline{T_{21}} \overline{T_{12}})},$$

$$*\overline{B_{21}} = \frac{\overline{T_{21}} \alpha_m^2}{(\overline{T_{12}} \overline{T_{21}} - \overline{T_{11}} \overline{T_{22}}) R}, \overline{B_{22}} = \frac{(\overline{T_{13}} \overline{T_{21}} - \overline{T_{11}} \overline{T_{23}})}{(\overline{T_{12}} \overline{T_{21}} - \overline{T_{11}} \overline{T_{22}})}, \overline{B_{23}} = \frac{(\overline{T_{14}} \overline{T_{21}} - \overline{T_{11}} \overline{T_{24}})}{(\overline{T_{12}} \overline{T_{21}} - \overline{T_{11}} \overline{T_{22}})},$$

$$L_{11}(w) = H_{45} w_{,xx} + H_{45} w_{,yy} + (H_{55} + H_{44}) w_{,yx} - K_1 w + K_2 \left( \frac{\partial^2 w}{\partial x^2} + \frac{\partial^2 w}{\partial y^2} \right),$$

$$L_{12}(\phi_x) = H_{45} \phi_{x,x} + H_{55} \phi_{x,y},$$

$$L_{13}(\phi_y) = H_{44} \phi_{y,x} + H_{45} \phi_{y,y},$$

$$L_{14}(f) = \frac{1}{R} \frac{\partial^2 f}{\partial x^2},$$

$$L_{21}(w) = -H_{44} \frac{\partial w}{\partial x} - H_{45} \frac{\partial w}{\partial y},$$

$$L_{22}(\phi_x) = \overline{A_{14}} \phi_{x,xx} + \overline{A_{36}} \phi_{x,yy} + (\overline{A_{16}} + \overline{A_{34}}) \phi_{x,xy} - H_{44} \phi_x,$$

$$L_{23}(\phi_y) = \overline{A_{16}} \phi_{y,xx} + \overline{A_{35}} \phi_{y,yy} + (\overline{A_{36}} + \overline{A_{15}}) \phi_{y,yx} - H_{45} \phi_y,$$

$$L_{24}(f) = (\overline{A_{11}} - \overline{A_{33}}) \frac{\partial^3 f}{\partial x \partial y^2} + \overline{A_{12}} \frac{\partial^3 f}{\partial x^3} + \overline{A_{31}} \frac{\partial^3 f}{\partial y^3} + (\overline{A_{33}} - \overline{A_{13}}) \frac{\partial^3 f}{\partial x^2 \partial y},$$

$$L_{34}(f) = (\overline{A_{31}} - \overline{A_{23}}) \frac{\partial^3 f}{\partial x \partial y^2} + \overline{A_{21}} \frac{\partial^3 f}{\partial y^3} + \overline{A_{33}} \frac{\partial^3 f}{\partial x^3} + (\overline{A_{22}} - \overline{A_{33}}) \frac{\partial^3 f}{\partial x^2 \partial y}$$

$$L_{32}(\phi_x) = \overline{A_{34}} \phi_{x,xx} + \overline{A_{26}} \phi_{x,yy} + (\overline{A_{36}} + \overline{A_{24}}) \phi_{x,xy} - H_{45} \phi_x,$$

$$L_{33}(\phi_y) = \overline{A_{36}} \phi_{y,xx} + \overline{A_{25}} \phi_{y,yy} + (\overline{A_{26}} + \overline{A_{35}}) \phi_{y,yx} - H_{55} \phi_y,$$

$$L_{31}(w) = -H_{45} \frac{\partial w}{\partial x} - H_{55} \frac{\partial w}{\partial y},$$

$$l_{11}(W) = -k_1 W - k_2 (\alpha^2 + \beta^2) W, l_{12}(\Phi_x) = -H_{45} \alpha \Phi_x,$$

$$\begin{aligned}
l_{13}(\Phi_y) &= -H_{45}\beta\Phi_y, \quad l_{14}(W + W_0)\Phi_x = \overline{B}_{12}\alpha\beta\frac{32}{9}, \\
l_{15}(W + W_0)\Phi_y &= \overline{B}_{13}\alpha\beta\frac{32}{9}, \quad l_{17}W(W + W_0) = \overline{B}_{11}\alpha\beta\frac{32}{9}, \\
l_{16}(W + W_0) &= -\left(N_x^0\alpha^2 + N_y^0\beta^2\right) - H_{45}\alpha^2 - H_{45}\beta^2, \\
l_{18}W(W + W_0)(W + 2W_0) &= -\frac{1}{16}\left(\frac{\alpha_m^4}{A_{11}^*} + \frac{\beta_n^4}{A_{22}^*}\right), \\
l_{19} &= \frac{16}{mn\pi^2}, \\
l_{21} &= -\overline{B}_{11}\left(\overline{A}_{11} - \overline{A}_{33}\right)\beta^2\alpha - \overline{B}_{11}\overline{A}_{12}\alpha^3 + \overline{B}_{21}\overline{A}_{31}\beta^3 + \overline{B}_{21}\left(\overline{A}_{33} - \overline{A}_{13}\right)\alpha^2\beta, \\
l_{22} &= -\overline{A}_{14}\alpha^2 - \overline{A}_{36} - H_{44} - \overline{B}_{12}\left(\overline{A}_{11} - \overline{A}_{33}\right)\beta^2\alpha - \overline{B}_{12}\overline{A}_{12}\alpha^3 + \overline{B}_{22}\overline{A}_{31}\beta^3 + \overline{B}_{22}\left(\overline{A}_{33} - \overline{A}_{13}\right)\alpha^2\beta, \\
l_{23} &= -\left(\overline{A}_{36} + \overline{A}_{15}\right)\alpha\beta - \overline{B}_{13}\left(\overline{A}_{11} - \overline{A}_{33}\right)\beta^2\alpha - \overline{B}_{13}\overline{A}_{12}\alpha^3 + \overline{B}_{23}\overline{A}_{31}\beta^3 + \overline{B}_{23}\left(\overline{A}_{33} - \overline{A}_{13}\right)\alpha^2\beta, \\
l_{24} &= -H_{44}\alpha, \\
l_{25} &= \overline{A}_{12}\frac{\beta}{A_{22}^*}\frac{2}{3}\frac{4}{ab}, \\
l_{31} &= \overline{B}_{21}\left(\overline{A}_{31} - \overline{A}_{23}\right)\beta^2\alpha W - \overline{B}_{11}\overline{A}_{21}\beta^3 W + \overline{B}_{21}\overline{A}_{33}\alpha^3 W - \overline{B}_{11}\left(\overline{A}_{22} - \overline{A}_{33}\right)\alpha^2\beta W, \\
l_{32} &= -\left(\overline{A}_{36} + \overline{A}_{24}\right)\alpha\beta + \overline{B}_{22}\left(\overline{A}_{31} - \overline{A}_{23}\right)\beta^2\alpha - \overline{B}_{12}\overline{A}_{21}\beta^3 + \overline{B}_{22}\overline{A}_{33}\alpha^3 - \overline{B}_{12}\left(\overline{A}_{22} - \overline{A}_{33}\right)\alpha^2\beta, \\
l_{33} &= +\overline{B}_{23}\left(\overline{A}_{31} - \overline{A}_{23}\right)\beta^2\alpha - \overline{B}_{13}\overline{A}_{21}\beta^3 + \overline{B}_{23}\overline{A}_{33}\alpha^3 - \overline{B}_{13}\left(\overline{A}_{22} - \overline{A}_{33}\right)\alpha^2\beta - \overline{A}_{36}\alpha^2 - \overline{A}_{25}\beta^2 - H_{55}, \\
l_{34} &= -H_{55}\beta, \\
l_{35} &= \frac{\alpha}{A_{11}^*}\overline{A}_{21}\frac{2}{3}\frac{4}{ab}, \\
X_{11} &= -\overline{B}_{11}\left(A_{11}^*\beta^2 + A_{12}^*\alpha^2\right)\frac{4}{\alpha\beta} - 4A_{16}^*\overline{B}_{21} - 4B_{11}^*\alpha - 4B_{12}^*\beta, \\
X_{12} &= -\overline{B}_{12}\left(A_{11}^*\beta^2 + A_{12}^*\alpha^2\right)\frac{4}{\alpha\beta} - 4A_{16}^*\overline{B}_{22}, \quad X_{13} = -\overline{B}_{13}\left(A_{11}^*\beta^2 + A_{12}^*\alpha^2\right)\frac{4}{\alpha\beta} - 4A_{16}^*\overline{B}_{23}, \\
X_{14} &= A_{11}^*ab, \quad X_{15} = A_{12}^*ab, \quad X_{16} = -\frac{\alpha^2ab}{4}, \\
\Phi_a &= ab\Delta T(\alpha_1 D_{11}^* + \alpha_2 D_{12}^*),
\end{aligned}$$

$$X_{21} = -\frac{4}{\alpha\beta} \overline{B_{11}} (A_{12}^* \beta^2 + A_{22}^* \alpha^2) - 4A_{26}^* \overline{B_{21}} - 4B_{21}^* \alpha - 4B_{22}^* \beta - \frac{1}{R} \frac{4}{\alpha\beta}$$

$$X_{22} = -\frac{4}{\alpha\beta} \overline{B_{12}} (A_{12}^* \beta^2 + A_{22}^* \alpha^2) - 4A_{26}^* \overline{B_{22}}, X_{23} = -\frac{4}{\alpha\beta} \overline{B_{13}} (A_{12}^* \beta^2 + A_{22}^* \alpha^2) - 4A_{26}^* \overline{B_{23}}$$

$$X_{24} = A_{12}^* ab, X_{25} = A_{22}^* ab, X_{26} = -\beta^2 \frac{ab}{4}, \Phi_b = \Delta T(\alpha_1 D_{21}^* + \alpha_2 D_{22}^*)$$

$$s_{11} = \left( \frac{X_{21}X_{15} - X_{11}X_{25}}{X_{14}X_{25} - X_{24}X_{15}} \right), s_{12} = \left( \frac{X_{22}X_{15} - X_{12}X_{25}}{X_{14}X_{25} - X_{24}X_{15}} \right), s_{13} = \left( \frac{X_{23}X_{15} - X_{13}X_{25}}{X_{14}X_{25} - X_{24}X_{15}} \right),$$

$$s_{14} = \left( \frac{X_{26}X_{15} - X_{16}X_{25}}{X_{14}X_{25} - X_{24}X_{15}} \right), s_{15} = \left( \frac{X_{15}}{X_{14}X_{25} - X_{24}X_{15}} \right), s_{16} = -\frac{X_{25}}{X_{14}X_{25} - X_{24}X_{15}}$$

$$s_{21} = \left( \frac{X_{21}X_{14} - X_{11}X_{24}}{X_{15}X_{24} - X_{25}X_{14}} \right), s_{22} = \left( \frac{X_{22}X_{14} - X_{12}X_{24}}{X_{15}X_{24} - X_{25}X_{14}} \right), s_{23} = \left( \frac{X_{23}X_{14} - X_{13}X_{24}}{X_{15}X_{24} - X_{25}X_{14}} \right),$$

$$s_{24} = \left( \frac{X_{26}X_{14} - X_{16}X_{24}}{X_{15}X_{24} - X_{25}X_{14}} \right), s_{25} = \frac{X_{14}}{X_{15}X_{24} - X_{25}X_{14}}, s_{26} = -\frac{X_{24}}{X_{15}X_{24} - X_{25}X_{14}}$$

$$c_1 = \frac{16}{mn\pi^2 R} s_{21} \beta^2, c_2 = \frac{16}{mn\pi^2 R} s_{22} \beta^2, c_3 = \frac{16}{mn\pi^2 R} s_{23} \beta^2$$

$$c_4 = -s_{12} \alpha^2 - s_{22} \beta^2, c_5 = -s_{13} \alpha^2 - s_{23} \beta^2, c_6 = -\left(s_{15} \alpha^2 + s_{25} \beta^2\right) \Phi_b - \left(s_{16} \alpha^2 + s_{26} \beta^2\right) \Phi_a$$

$$c_7 = -\left(s_{14} \alpha^2 + s_{24} \beta^2\right), c_8 = -s_{11} \alpha^2 - s_{21} \beta^2, c_9 = \frac{16}{mn\pi^2 R} s_{24} \beta^2$$

$$c_{10} = \frac{16}{mn\pi^2 R} s_{25} \beta^2 \Phi_b + \frac{16}{mn\pi^2 R} s_{26} \Phi_a \beta^2$$

$$a_1 = l_{11}, a_3 = l_{12} \frac{(l_{23}l_{33} - l_{25}l_{33})}{(l_{22}l_{33} - l_{32}l_{23})} + l_{13} \frac{(l_{32}l_{25} - l_{22}l_{33})}{(l_{23}l_{32} - l_{22}l_{33})},$$

$$a_2 = l_{12} \left[ \frac{l_{23}(l_{31} + l_{33}) - l_{33}(l_{21} + l_{24})}{(l_{22}l_{33} - l_{32}l_{23})} \right] + l_{13} \left[ \frac{l_{32}(l_{21} + l_{24}) - l_{22}(l_{31} + l_{33})}{(l_{23}l_{32} - l_{22}l_{33})} \right] + l_{16} - \left(N_x^0 \alpha^2 + N_y^0 \beta^2\right),$$

$$a_4 = l_{14} \left[ \frac{l_{23}(l_{31} + l_{33}) - l_{33}(l_{21} + l_{24})}{(l_{22}l_{33} - l_{32}l_{23})} \right] + l_{15} \left[ \frac{l_{32}(l_{21} + l_{24}) - l_{22}(l_{31} + l_{33})}{(l_{23}l_{32} - l_{22}l_{33})} \right],$$

$$a_5 = l_{14} \frac{(l_{23}l_{33} - l_{25}l_{33})}{(l_{22}l_{33} - l_{32}l_{23})} + l_{15} \frac{(l_{32}l_{25} - l_{22}l_{33})}{(l_{23}l_{32} - l_{22}l_{33})},$$

$$a_6 = l_{17}, a_7 = l_{18}, a_8 = l_{19}.$$