Appendix B

System of Equations

$$\sum F_y = 0 : R_{1,y} + Fsin(\theta) + R_{2,y} - Psin(\theta) + R_{3,y} - \int_0^x \tilde{q}(x)d\tilde{x} = 0 \tag{B.1}$$

$$\sum F_z = 0 : R_{1,z} + Fcos(\theta) + R_{2,z} - Pcos(\theta) + R_{3,z} = 0 \tag{B.2}$$

$$M_z(l_a) = 0 : -R_{1,y}[l_a - x_1] + \int_0^{l_a}\int_0^x \tilde{q}(x)d\tilde{x}dx - Fsin(\theta)[l_a - x_{A_1}] - R_{2,y}[l_a - x_2] + Psin(\theta)[l_a - x_{A_2}] - R_{3,y}[l_a - x_3] = 0 \tag{B.3}$$

$$M_y(l_a) = 0 : -R_{1,z}[l_a - x_1] - Fcos(\theta)[l_a - x_{A_1}] - R_{2,z}[l_a - x_2] + Pcos(\theta)[l_a - x_{A_2}] - R_{3,z}[l_a - x_3] = 0 \tag{B.4}$$

$$\begin{aligned} T_x(l_a) = 0 : -\int_0^{l_a} \tau(\tilde{x})d\tilde{x} + R_{1,y}(z_h - \tilde{z}) + R_{2,y}(z_h - \tilde{z}) + R_{3,y}(z_h - \tilde{z}) - Fcos(\theta)(y_p) + Fsin(\theta)(0 - \tilde{z}) \\ +Pcos(\theta)(y_p) - Psin(\theta)(0 - \tilde{z}) = 0 \end{aligned} \tag{B.5}$$

$$\frac{1}{EI_{zz}}(-\int_0^{x_1}\int_0^{x_b}\int_0^{x_a}\int_0^x \tilde{q}(x)d\tilde{x}dx_a dx_b dx_c) + C_1x_1 + C_2 = d_1cos(\theta \tag{B.6}$$

$$\frac{1}{EI_{zz}}(\frac{R_{1,y}}{6}[x_2 - x_1]^3 - \int_0^{x_2}\int_0^{x_b}\int_0^{x_a}\int_0^x \tilde{q}(x)d\tilde{x}dx_a dx_b dx_c + \frac{Fsin(\theta)}{6}[x_2 - x_{A_1}]^3) + C_1x_2 + C_2 = 0 \tag{B.7}$$

$$\frac{1}{EI_{zz}}(\frac{R_{1,y}}{6}[x_3-x_1]^3-\int_0^{x_3}\int_0^{x_b}\int_0^{x_a}\int_0^{x}\tilde{q}(x)d\tilde{x}dx_a dx_b dx_c+\frac{Fsin(\theta)}{6}[x_3-x_{A_1}]^3 \\ +\frac{R_{2,y}}{6}[x_3-x_2]^3-\frac{Psin(\theta)}{6}[x_3-x_{A_2}]^3)+C_1x_3+C_2=d_3cos(\theta) \tag{B.8}$$

$$C_3x_1+C_4=-d_1sin(\theta) \tag{B.9}$$

$$\frac{1}{EI_{yy}}(\frac{R_{1,z}}{6}[x_2-x_1]^3+\frac{F\cos(\theta)}{6}[x_2-x_{A_1}]^3)+C_3x_2+C_4=0 \tag{B.10}$$

$$\frac{1}{EI_{yy}}(\frac{R_{1,z}}{6}[x_3-x_1]^3+\frac{F\cos(\theta)}{6}[x_3-x_{A_1}]^3+\frac{R_{2,z}}{6}[x_3-x_2]^3-\frac{Pcos(\theta)}{6}[x_3-x_{A_2}]^3)+C_3x_3+C_4=-d_3sin(\theta) \tag{B.11}$$

$$\frac{1}{GJ}(-\int_0 x_A\int_0^{x}\tau(\tilde{x})d\tilde{x}dx+R_{1,y}(z_h-\tilde{z})[x_A-x_1])+C_5=0 \tag{B.12}$$