A widespread internal resonance phenomenon in functionally graded material plates with longitudinal speed

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Appendix

The coefficients in Eq. (31) are as follows for ($\bar{m}=1, \bar{n}=1$) and ($\bar{j}=2, \bar{k}=1$)

$$\bar{M}_1 = \frac{c}{\int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}}$$

$$\bar{M}_2 = -\frac{16V}{3a}$$

$$\bar{M}_3 = \frac{\pi^4 D_{11}}{a^4 \int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}} + \frac{2\pi^4 D_{12}}{a^2 b^2 \int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}} + \frac{4\pi^4 D_{66}}{a^2 b^2 \int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}} + \frac{\pi^2 N_0}{a^2 \int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}} - \frac{\pi^2 V^2}{a^2} + \frac{\pi^4 D_{22}}{b^4 \int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}}$$

$$\bar{M}_4 = -\frac{8cV}{3a\int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}}$$

$$\bar{M}_5 = \left(\frac{3\pi^4 A_{11}}{32a^4} + \frac{3\pi^4 A_{12}}{16a^2b^2} - \frac{\pi^4 A_{66}}{8a^2b^2} + \frac{3\pi^4 A_{22}}{32b^4}\right) \Big/ \int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}$$

$$\bar{M}_6 = \left(\frac{3\pi^4 A_{11}}{4a^4} + \frac{21\pi^4 A_{12}}{16a^2b^2} - \frac{\pi^4 A_{66}}{a^2b^2} + \frac{3\pi^4 A_{22}}{16b^4}\right) \Big/ \int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}$$

$$\bar{M}_7 = \left(\frac{32\pi^2 B_{11}}{9a^4} + \frac{160\pi^2 B_{12}}{9a^2b^2} + \frac{32\pi^2 B_{66}}{9a^2b^2} + \frac{32\pi^2 B_{22}}{9b^4}\right) \Big/ \int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}$$

$$\bar{M}_8 = \left(\frac{3584\pi^2 B_{11}}{45a^4} + \frac{512\pi^2 B_{12}}{9a^2b^2} + \frac{1664\pi^2 B_{66}}{45a^2b^2} + \frac{128\pi^2 B_{22}}{45b^4}\right) \Big/ \int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}$$

$$\bar{M}_9 = \frac{4F_0}{ab\int_{-\frac{h}{2}}^{\frac{h}{2}} \rho(z)\mathrm{dz}} \sin(\frac{\pi x_0}{a}) \sin(\frac{\pi y_0}{b}) \qquad \text{(A1)}$$

$$\bar{S}_1=\frac{16V}{3a}$$

$$\bar{S}_2=\frac{c}{\int_{-\frac{h}{2}}^{\frac{h}{2}}\rho(\mathrm{z})\mathrm{dz}}$$

$$\bar{S}_3=\frac{8cV}{3a\int_{-\frac{h}{2}}^{\frac{h}{2}}\rho(\mathrm{z})\mathrm{dz}}$$

$$\bar{S}_4=\frac{1}{a^4b^4\int_{-\frac{h}{2}}^{\frac{h}{2}}\rho(\mathrm{z})\mathrm{dz}}(\pi^4a^4D_{22}-4\pi^2a^2b^4V^2\int_{-\frac{h}{2}}^{\frac{h}{2}}\rho(\mathrm{z})\mathrm{dz}+4\pi^2a^2b^4N_0+$$

$$8\pi^4a^2b^2D_{12}+16\pi^4a^2b^2D_{66}+16\pi^4b^4D_{11})$$

$$\bar{S}_5=\frac{\pi^4(3a^4A_{22}+24a^2A_{12}b^2-16a^2A_{66}b^2+48A_{11}b^4)}{32a^4b^4\int_{-\frac{h}{2}}^{\frac{h}{2}}\rho(\mathrm{z})\mathrm{dz}}$$

$$\bar{S}_6=\frac{\pi^4(3a^4A_{22}+9a^2A_{12}b^2-4a^2A_{66}b^2+12A_{11}b^4)}{16a^4b^4\int_{-\frac{h}{2}}^{\frac{h}{2}}\rho(\mathrm{z})\mathrm{dz}}$$

$$\bar{S}_7=\frac{128\pi^2(2a^4B_{22}+25a^2b^2B_{12}-4a^2b^2B_{66}+5b^4B_{11})}{45a^4b^4\int_{-\frac{h}{2}}^{\frac{h}{2}}\rho(\mathrm{z})\mathrm{dz}} \tag{A2}$$