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ABBREVIATIONS AND SYMBOLS

| | |
|--------------------|---|
| A, B | coefficients defined by Eq. (14) |
| C_i | unknown constants |
| C_{ij} | elastic constants |
| Gl | Glass/epoxy |
| Gr | Graphite/epoxy |
| H | total thickness of cylinder |
| $H^{(i)}$ | thickness of a layer |
| H/R | total thickness to mean radius ratio |
| $I()$ | modified Bessel function of the first kind with argument () |
| $J()$ | regular Bessel function of the first kind with argument () |
| $K()$ | modified Bessel function of the second kind with argument () |
| R | mean radius |
| \tilde{S}_k | stress components of the k^{th} layer |
| $U(r), V(r), W(r)$ | functions of radial coordinate |
| \tilde{U}_k | displacement components of the k^{th} layer |
| X, Y, Z | cartesian coordinates |
| $Y()$ | regular Bessel function of the second kind with argument () |
| c | phase velocity |
| n | circumferential wavenumber |
| p, q | radial wavenumbers |
| r, θ , z | cylindrical coordinates |
| r_k, r_{k+1} | inner and outer radius of the k^{th} layer |
| t | time |
| u, v, w | radial, tangential, and axial displacements |
| α, β | coefficients defined by Eq. (16) |

| | |
|-----------------------|--|
| γ_{ij} | components of shear strain |
| δ | sign factors defined by Eq. (45) |
| ε_i | sign factors |
| ε_{ii} | components of normal strain |
| ζ | normalized axial wavenumber |
| η^2 | coefficient defined by Eq. (26) or Eq. (27) |
| λ^2 | coefficient defined by Eq. (23) |
| μ | shear modulus |
| ξ | axial wavenumber |
| ξ_{ref} | reference axial wavenumber |
| ρ | mass density |
| σ_{ij} | components of stress |
| $\phi(r)$ | potential function |
| χ^2 | coefficient defined by Eq. (20) |
| ψ_k | arguments of Bessel functions at $r = r_k$ |
| ψ_{k+1} | arguments of Bessel functions at $r = r_{k+1}$ |
| ω | circular frequency |
| ω_{ref} | reference frequency |
| Ω | normalized frequency |