The 2024 World Congress on
The 2024 Structures Congress (Structures24)
19-22, August, 2024, The K hotel, Seoul, Korea

Large Amplitude Free Vibration of FG-GPLRC Porous Cylindrical Panels with an Internal Crack

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ABSTRACT

The nonlinear free vibration of porous functionally graded graphene platelet-reinforced composite (FG-GPLRC) cylindrical panel with a central crack is numerically investigated by a 2-D extended natural element method (XNEM). The internal crack is modeled by combining the phase field formulation (PFF) and the virtual geometry transformation. The displacement is basically expressed based on the first-order shear deformation theory (FSDT) and approximated with Laplace interpolation functions (for the non-singular displacement part) and the crack-tip singular functions (for the singular displacement part) without the grid refinement around crack tips. The validity of developed numerical method is examined through the benchmark test, and the nonlinear-linear frequency ratio is profoundly investigated with respect to the major parameters associated with GPLs and porosity. The numerical results reveal that the nonlinear free vibration is remarkably influenced by the amounts and distributions of GPLs and porosity.

ACKNOWLEDGEMENT

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (No. RS-2023-00240618).

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