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Vibration of Nanobeam Subjected to Constant Magnetic Field and Ramp-Type Thermal Loading under Non-Fourier Heat Conduction Law of Lord-Shulman

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Abstract : In this work, the usual Euler–Bernoulli nanobeam has been modeled in the context of Lord-Shulman thermoelastic theorem, which contains non-Fourier heat conduction law. The nanobeam has been subjected to a constant magnetic field and ramp-type thermal loading. The Laplace transform definition has been applied to the governing equations, and the solutions have been obtained by using a direct approach. The inversions of the Laplace transform have been calculated numerically by using Tzou approximation method. The solutions have been applied to a nanobeam made of silicon nitride. The distributions of the temperature increment, lateral deflection, strain, stress, and strain-energy density have been represented in figures with different values of the magnetic field intensity and ramp-time heat parameter. The value of the magnetic field intensity and ramp-time heat parameter have significant effects on all the studied functions, and they could be used as tuners to control the energy which has been generated through the nanobeam.

Keywords : nanobeam, vibration, constant magnetic field, ramp-type thermal loading, non-Fourier heat conduction law
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