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Low Velocity Impact Response of Sandwich Beams with Soft Cores and Carbon Nanotube Reinforced Face Sheets Based on Extended High Order Sandwich Panel Theory

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Abstract

Response of sandwich beam with carbon nanotube reinforced composite (CNTRC) face sheets and soft core subjected to the action of an impacting mass based on the Extended High Order Sandwich Panel Theory (EHSAPT) is first analysed. Distribution of fibers through the thickness of the face sheets could be uniform or functionally graded (FG). Contact force between the impactor and the beam is obtained using the conventional Hertz law. The field equations are derived via the Ritz based applied to the total energy of the system. The solution is obtained in the time domain by implementing the well- known Runge- Kutta method. After examining the validity of the present solution, the effects of distribution of Carbon Nanotubes (CNTs), nanotube volume fraction, core-to-face sheet thickness ratio, initial velocity of the impactor and the impactor mass are studied in detail. Finally, it is concluded that, the highest peak contact force and the lowest indentation of the top face sheet belong to the sandwich beam with V distribution figure of face sheet, followed by the UD and Λ -ones, respectively. Also, numerical results reveal that employing FG-CNTs in face sheets has a prominent role on impact response of the sandwich panel with soft core.

Keywords

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