The effects of rotation on the frequencies and critical speed of CNTs/fiber/polymer/metal laminates cylindrical shell

ABSTRACT

This work focuses on the frequencies of rotating carbon nanotubes (CNTs)/fiber/polymer/metal laminates (CNTFPMLs) thin circular cylindrical shell. The cylindrical shell is studied on the basis of Love's first approximation shell theory with simply supported boundary condition. In this manuscript, Eshelby-Mori-Tanaka is used to define the modulus of carbon nanotubes reinforced composites (CNTRCs) cylindrical shell. In addition, fibers can be reinforced using the obtained matrix by means of extended rule of mixture. The influence of various parameters for example characteristics of fiber phase material, such as circumferential and axial wave numbers, lay-ups, metal volume fraction, composite volume fraction and CNTs mass fraction on the frequencies of rotating CNTFPMLs cylindrical shell have been studied. The outputs illustrated by growing rotational speed, the frequencies of CNTFPMLs cylindrical shell change differently for different fiber volume fractions. Also, the backward and forward frequencies of functionally graded ðFGÞ X and FG O distributions are more and less than the uniformly distributed (UD) for rotational speed equals to 1, respectively, while this process is reversed for rotational speed equals to 5. In 10 and 20 rotational speeds, while the frequencies of backward and forward modes for FG X distribution are more and less than the UD, respectively, but this procedure is reversed in FG O distribution.