**Abstract Word template of APVC2025**

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**Abstract:** An analytical study to predict the vibration response of a ribbed plate with free boundary conditions is presented. The analytical solution was derived using a double cosine integral transform technique and then utilized to study the free and forced vibration of the ribbed plate, as well as the effect of the rib on the modal response of the uniform plate. It is shown that in addition to the three zero-frequency rigid body modes of the plate, the vibration modes of the uniform plate can be classified into four mode groups according to the symmetric properties of the plate with respect to the two orthogonal middle lines parallel to the plate edges. The four mode groups correspond to a double symmetric group, a double anti-symmetric group and two symmetric/anti-symmetric groups. Whilst the inclusion of the rib to the plate is shown to cause distortion to the distribution of vibration modes, most modes can still be traced back to the original modes of the uniform plate. Both the mass and stiffness of the rib are shown to affect the modal vibration of the uniform plate, whereby a dominant effect from the rib mass leads to a decrease in the modal frequency of the plate, whereas a dominant effect from the rib stiffness leads to an increase in plate modal frequency. When the stiffened rib behaves as an effective boundary to the plate vibration, an original plate mode becomes a pair of degenerate modes, whereby one mode has a higher frequency and the other mode has a lower frequency than that of the original mode.

**Keywords**: Vibration; Noise; Active control; Diagnostics; Wavelet transform