National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Design and analysis of single element based Quasi Zero Stiffness material for low frequency vibration isolation
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Venue	: CAD Lab, ID Department
Date and Time	: 01 Jul 2022 (5.00 PM)

Abstract : Vibration produces a harmful effect in many engineering fields such as civil structure, failure of precision equipment, and disturbance in spacecraft components. The frequency ranges over which passive vibration isolator performed stiffness are less required to support the static load. This can be improved by a quasi-zero stiffness mechanism(QZS). In QZS system has high static stiffness to support the static load and low dynamic stuffiness for vibration isolation at low frequency. QZS design is achieved by positive element and negative element combination. QZS unit cell is designed snap-through behaviour cosine beam and bending dominating semi-circular arc arranged for negative stiffness and positive stiffness respectively. The proposed work investigated the forced displacement characteristic and dynamic characteristics of the QZS system. Frequency response of QZS design validated numerically developed by Harmonic balance method using duffing equation. To investigate dynamic properties combination of the polynomial fit equation and solving Harmonic Balance Method compared with the analytical result using the force displacement relation result. Stability analysis is validated and investigated unstable region. A compact integrated vibration isolator with high static stiffness and low dynamic stiffness has been designed which is constructed single structure. The force displacement characteristic of IQZS isolator has been investigated numerically. The IQZS exhibits constant force and high static stiffness with low dynamic stiffness and compare static performance with QZS model made with a cosine beam and semi-circular arc compared for verifying the accuracy. The advantage of the IQZS model is simple in design and manufacture and suitable for high static stiffness and low dynamic stiffness requirement. To isolate low-frequency vibration a novel integrated QZS design is proposed and force-displacement characteristics were investigated numerically.