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Stability of a Spinning Disk Under a Stationary Oscillating Unit

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This paper studies the free vibration and stability of a spinning annular plate transversely in contact with a stationary oscillating unit. The oscillating unit consists of two parallel combinations of springs and dampers attached above and under a mass. Therefore, the displacement of the mass is not the same as that of the disk at the contact point. First the equations of motion of the spinning disk and the oscillating unit are given in an inertial coordinate system. The Galerkin method is then applied to obtain the discretized system equations for the disk. Finally the stability analysis is conducted by investigating the eigenvalue problem of the combined system. Numerical results show that extra flutter-type instability is generated between the oscillating unit and the reflected modes of the disk, and these unstable regions are much larger than those of the flutter-type instability between the reflected and backward modes of the disk.

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