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Nonlinear Vibrations of Jeffcott Rotor with Preloaded Snubber Ring

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Nonlinear vibrations of a Jeffcott rotor system with a preloaded snubber ring subjected to out of balance excitation are investigated theoretically and experimentally. The details of the design, experimental set-up and mathematical modelling of the system will be presented. The rotor makes intermittent contacts with the preloaded snubber ring and it can produce five different contact regimes which are determined using the principle of the minimum elastic energy in the springs supporting the snubber ring. As a result this rotor system is modelled as a nonlinear piecewise smooth dynamical system, for which a suite of approximate methods has been devised. Full details on these methods and their accuracy will be given during the lecture. Chaotic behaviour and co-existence of attractors have been found. A comparison between the theoretical and experimental results made by using bifurcation diagrams, phase portraits and Poincaré maps shows a good correlation between theory and experiments.

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