## SYNOPSIS

*In this investigation, the effect of bearing radial stiffness on the critical speeds of a shaft is determined theoretically and by experiments. For the calculation of the critical speeds of a flexibly supported shaft, new methods are proposed. These methods give simple equations which are easily solvable for the critical speeds. The suggested methods are also applicable in the cases of overhanging shafts and shafts with discs mounted on them at centre.*

*In order to verify the calculated results, an experimental rig is designed and built, wherein it is possible to vary the radial stiffness of the bearings or supports, of the shaft. The Shaft is vertical and is driven by an air turbine mounted at its centre, which in turn operates with compressed air. The shaft speed is measured by optical and electrical means whereas the shaft vibration is measured by means of inductive pick-ups.*

*It is found from the results obtained by the experiments that the critical speeds reduce with the reduction of bearing radial stiffness. The agreement between the experimentally measured and calculated values of the critical speeds is found to be good, assuring that the methods proposed predict correct values of critical speeds. During the experiments, secondary critical speeds and half and multi frequency whirlings are also observed.*