Abstract

Gearboxes are most important and commonly used mechanism for power transmission in various applications ranging from automobiles, industrial machines, aviation, power plants, to the equipment used in our daily lives. Modal analysis is a tool to find out the dynamic characteristics of any structure. Dynamic response of geared rotor system depends on gear mesh stiffness. Gear mesh stiffness is a time-varying phenomenon occurs due to meshing of gear pair.

This thesis investigates the effect of misalignment and friction force on time-varying mesh stiffness of spur gear pair. The effect of spalling and tooth crack on time-varying mesh stiffness has also been explored. Numerical simulation of geared rotor system has been carried out to study the effect of time-varying mesh stiffness on natural frequencies, mode shapes and frequency response functions of the geared rotor system.

An experimental setup consisting of a geared rotor supported on ball bearings has been fabricated for the validation of numerically obtained modal characteristics. Modal testing has been performed on the experimental setup to measure frequency response functions. The results obtained by experimental

testing are compared with the numerically simulated results. A good match has been found between experimental and numerically simulated results.

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