

Epicyclic Drive Trains: Analysis, Synthesis, and Applications

Dynamic Analysis of Epicyclic Gear Train by
Means of Computer Algebra

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Abstract

The paper illustrates the application of a systematic technique for the deduction of dynamic equations of epicyclic gear trains. The use of the proposed method is particularly amenable in conjunction with procedures for the computerized enumeration of geared kinematic chains. The discussed examples illustrate how the presented approach can be extended for computing the equivalent inertia of an epicyclic gear train or for the stability analysis of 2 d.o.f. gear trains.

Keywords: Epicyclic gear trains, gear trains multibody dynamics, stability analysis.

1 Introduction

Structural synthesis of gear drives by means of graph theory has been an important area of investigation in the field of kinematics. Although this theory is a tool frequently used in multibody dynamics, and distinguished researchers contributed to its development (e.g. [1, 2, 3]), pioneer analyses on the kinematic structure of mechanisms using graph theory are due to Freudenstein and his coworkers [4, 5].

The first procedure for the enumeration of geared kinematic chains (GKC), partly computerized and partly based on inspection, is due to Buchsbaum and Freudenstein [6]. Their landmark paper disclosed also noteworthy properties. The most important, which has been extensively used in subsequent

1

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