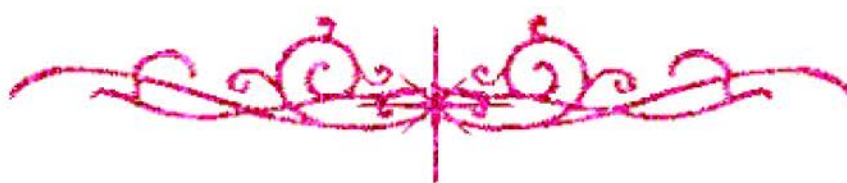


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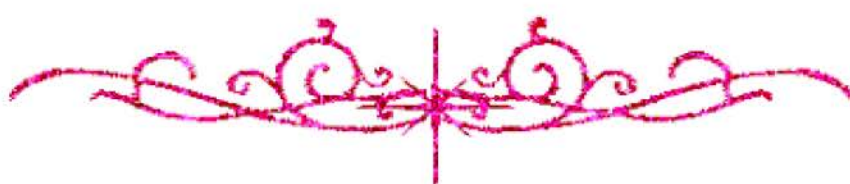
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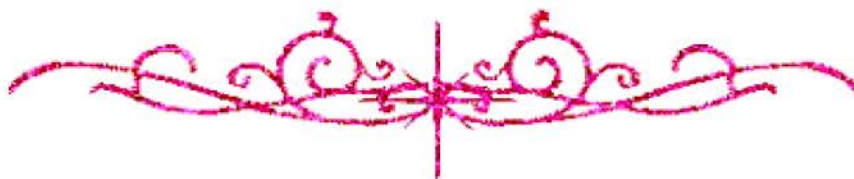
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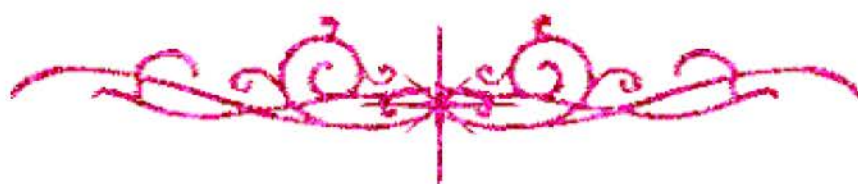
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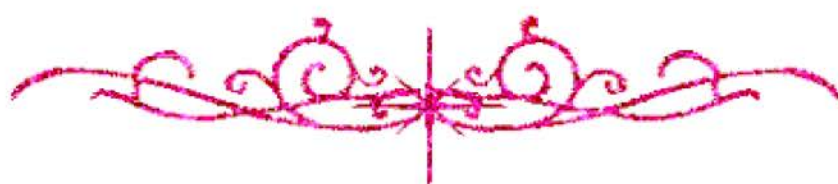
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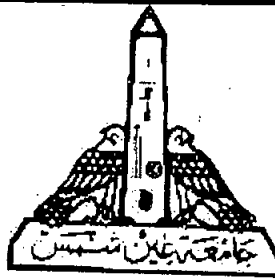


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بالرسالة صفحات لم ترد بالأصل





S/C

**Ain Shams University
Faculty of Engineering**

Department of Engineering Physics and
Mathematics

**LINEAR AND NONLINEAR STABILITY ANALYSIS OF
ROTTATING DYNAMICAL SYSTEMS WITH ELASTIC AND
DAMPED SUPPORTS**

By

Eng. Nasr Eldin Abdel-Sattar Abdel-Bary

B. Sc. Mechanical Engineering, 1993

B. Sc. Mathematics, 1997

A Thesis

Submitted in partial fulfillment of the requirements for the degree of
M. Sc. in Engineering Mathematics

B

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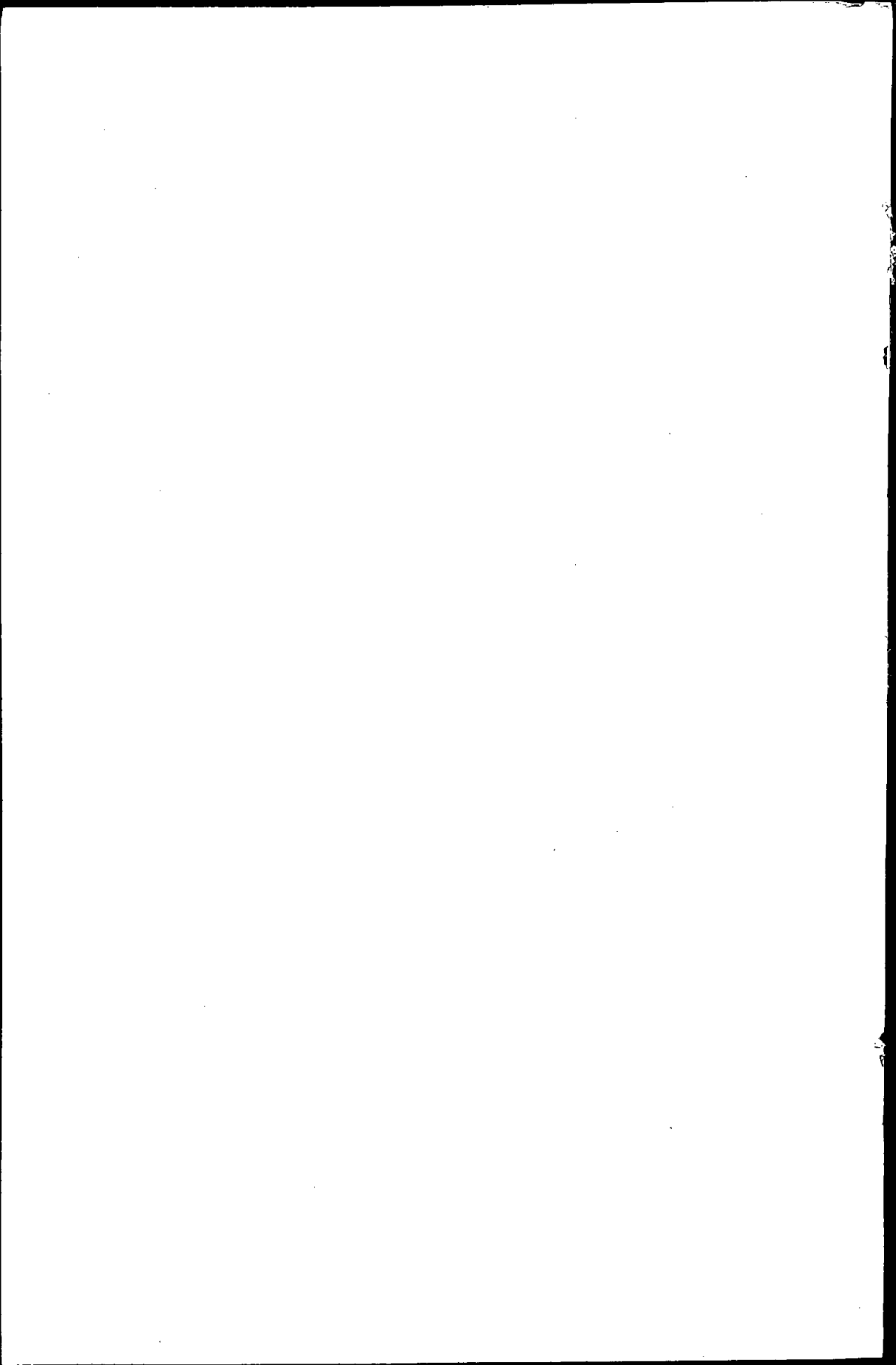
Supervised by:

Prof. Dr. Hassan N. A. Ismail

Prof. Dr. Talat F. Refaey

Prof. Dr. Abd Alla El-Marhomy

Cairo, 2002



Name: Nasr Eldin Abdel-Sattar Abdel-Bary

**Thesis: LINEAR AND NONLINEAR STABILITY ANALYSIS OF
ROTTATING DYNAMICAL SYSTEMS WITH ELASTIC
AND DAMPED SUPPORTS**

Degree: Master of Science in Engineering Mathematics

Examiners committee:

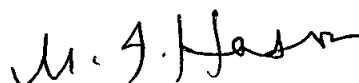
Name, Title and Affiliation

Signature

Prof. Dr. Adel Ahmed Mhmod Abdel-Gawad
Engineering Mathematics and Physics
Department, Faculty of Engineering, Cairo
University



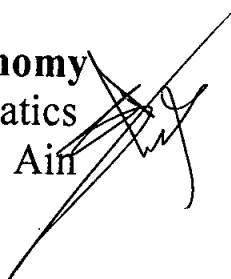
Prof. Dr. Mohamed Ibrahim Hassan
Head of Engineering Physics and
Mathematics Department, Faculty of
Engineering, Ain Shams University



Prof. Dr. Hassan Nasr Ismail
Head of Basic sciences, Benha
Higher Institute of Technology



Prof. Dr. Abd Alla Mustafa El-Marhomy
Engineering Physics and Mathematics
Department, Faculty of Engineering, Ain
Shams University



Date: 10 / 4 / 2002.

ABSTRACT

An inclusive historical background and literature review on the subject of rotor-bearing systems modeling and analysis are presented. The dynamics and stability of a uniform rigid spinning shaft with an appendage mounted on two dissimilar 8-coefficient end bearings possessing nonlinear anisotropic and cross coupling stiffness and damping coefficients are analyzed. Lagrange's equations are used to derive the system governing equations of motion in the form of four coupled nonlinear second order differential equations.

A linear stability analysis via Routh-Hurwitz stability criterion is presented for investigating the effects of various end support parameters on the dynamic stability of the translational and rotational modes of whirling motion of the system. Stability boundaries presented graphically as functions of the various end support nondimensionalized parameters afford a comprehensive demonstration of the effects of these parameters on the whirling stability of the system.

A nonlinear stability analysis of the system via Liapunov's direct method is performed. Based on the developed stability criterion of the considered system, the effect of nonlinearity of bearing stiffness and damping parameters on the asymptotic

stability is deduced. System stability regions in terms of the linearized parameters were also presented graphically.

Through the application of Routh-Hurwitz stability criterion and Liapunov direct method, it has been shown quantitatively that the stability of the system can be increased by (1) decreasing the bearing cross-coupling stiffness and damping parameters, (2) increasing the damping isotropy of the two end supports, and (3) increasing the principal stiffness and damping parameters of the two end supports.

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