NATURAL OSCILLATIONS IN APPROXIMATELY LINEAR SECOND ORDER DYANAMIC MODELS

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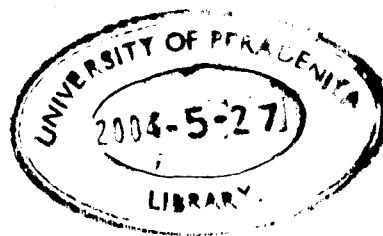for the award of the degree of*

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ABSTRACT

NATURAL OSCILLATIONS IN APPROXIMATELY LINEAR SECOND ORDER DYANAMIC MODELS

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Oscillations of second order non-linear dynamic models governed by

$$\frac{d^2x}{dt^2} + \omega^2 x = \varepsilon f\left(x, \frac{dx}{dt}\right)$$ are considered, where $|\varepsilon|$ is a small parameter. The perturbation methods based on small damping are applied to obtain approximate solutions of certain non-linear systems characterized by particular forms of $f\left(x, \frac{dx}{dt}\right)$.

As an application in Industrial Mathematics a special study is done on price fluctuations of a dynamic market model where the excess supply $Q_s - Q_d$ is a quadratic function of the price trend. It is proved that an isomorphism between the dynamic market model and a classical dynamical damper exists and the price function $p(t)$ converges to its intertemporal equilibrium price $\overline{p}$.