ABSTRAK

Skripsi ini membahas penyelesaian sistem persamaan diferensial linear simultan orde pertama dengan koefisien konstan dengan menggunakan metode nilai eigen.

Bentuk umum sistem persamaan diferensial linear simultan orde pertama dengan koefisien konstan ditulis

$$\frac{dx_1}{dt} = a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n + f_1(t)$$
$$\frac{dx_2}{dt} = a_{21}x_1 + a_{22}x_2 + \cdots + a_{2n}x_n + f_2(t)$$
$$\vdots$$
$$\frac{dx_n}{dt} = a_{n1}x_1 + a_{n2}x_2 + \cdots + a_{nn}x_n + f_n(t)$$

atau dalam bentuk perkalian vektor matriks ditulis $\frac{d\mathbf{x}}{dt} = \mathbf{A}\mathbf{x} + \mathbf{f}(t)$.

Nilai eigen λ dari matriks **A** adalah akar-akar persamaan karakteristik $|\ \mathbf{A} - \lambda\mathbf{I}\ | = 0$, yang dapat bernilai real dan berbeda, atau bernilai real dan ada yang sama, atau bernilai kompleks.

Penyelesaian sistem persamaan diferensial linear $\frac{d\mathbf{x}}{dt} = \mathbf{A}\mathbf{x} + \mathbf{f}(t)$ adalah $\mathbf{x}(t) = c_1\mathbf{x}_1(t) + c_2\mathbf{x}_2(t) + \ldots + c_n\mathbf{x}_n(t) + \mathbf{x}_p(t)$ di mana $\mathbf{x}_1(t) = \alpha_1 e^{\lambda_1 t}$, $\mathbf{x}_2(t) = \alpha_2 e^{\lambda_2 t}$, ..., $\mathbf{x}_n(t) = \alpha_n e^{\lambda_n t}$ merupakan penyelesaian sistem persamaan diferensial linear $\frac{d\mathbf{x}}{dt} = \mathbf{A}\mathbf{x}$ dan $\mathbf{x}_p(t)$ merupakan penyelesaian khusus sistem persamaan diferensial linear $\frac{d\mathbf{x}}{dt} = \mathbf{A}\mathbf{x} + \mathbf{f}(t)$.

Dalam skripsi ini penerapan yang dibahas adalah penerapan dalam bidang mekanika dan rangkaian listrik.

ABSTRACT

This thesis discusses the solution of first order linear differential simultaneous equation system with constant coefficient by using eigen value method.

The general form of first order linear differential simultaneous equation system with constant coefficient is written:

$$\tfrac{dx_1}{dt} = a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n + f_1(t)$$
$$\tfrac{dx_2}{dt} = a_{21}x_1 + a_{22}x_2 + \cdots + a_{2n}x_n + f_2(t)$$
$$\vdots$$
$$\tfrac{dx_n}{dt} = a_{n1}x_1 + a_{n2}x_2 + \cdots + a_{nn}x_n + f_n(t)$$

or in a multiplication of matrix vector form is written $\tfrac{d\mathbf{x}}{dt} = \mathbf{Ax} + \mathbf{f}(t)$.

Eigen values λ of matrix **A** are the roots of characteristic equation $|\ \mathbf{A} - \lambda\mathbf{I}\ | = 0$, that could be real and distinct, or real and some are equal same, or complex.

The solution of linear differential equation system $\tfrac{d\mathbf{x}}{dt} = \mathbf{Ax} + \mathbf{f}(t)$ is $\mathbf{x}(t) = c_1\mathbf{x}_1(t) + c_2\mathbf{x}_2(t) + \ldots + c_n\mathbf{x}_n(t) + \mathbf{x}_p(t)$
where $\mathbf{x}_1(t) = \alpha_1 e^{\lambda_1 t}$, $\mathbf{x}_2(t) = \alpha_2 e^{\lambda_2 t}$, ..., $\mathbf{x}_n(t) = \alpha_n e^{\lambda_n t}$ are the solutions of linear differential equation system $\tfrac{d\mathbf{x}}{dt} = \mathbf{Ax}$, and $\mathbf{x}_p(t)$ is a particular solution of linear differential equation system $\tfrac{d\mathbf{x}}{dt} = \mathbf{Ax} + \mathbf{f}(t)$.

In this thesis the applications discussed are the application in mechanical and electrical circuits.