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ASYMPTOTIC BEHAVIOR AT INFINITY OF THE GREEN FUNCTION OF A CLASS OF SYSTEMS INCLUDING WAVE PROPAGATION IN CRYSTALS

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0. Introduction

Many phenomena of wave propagation problems for example acoustic, electromagnetic and elastic waves, can be written in first order symmetric hyperbolic system. According to C.H. Wilcox [10] they can be represented in general as

$$E(x)D_tu-\sum_{j=1}^{n}A_jD_ju=f(t, x)\,. \tag{0.1}$$

where $t\in\boldsymbol{R}^1$ (time), $x\in\boldsymbol{R}^n$ (space), $D_t=\frac{1}{i}\frac{\partial}{\partial t}$ and $D_j=\frac{1}{i}\frac{\partial}{\partial x_j}$. Here $u=(u_1(t, x), \cdots, u_m(t, x))$ is a $\boldsymbol{C}^m$-valued function which describes the state of the media at position x and time t, $E(x)$ is a positive definite hermitian matrix valued function of x, A_j's are $m\times m$ constant hermitian matrices and $f(t, x)=(f_1(t, x), \cdots, f_m(t, x))$ is a prescribed function which specifies the sources acting in the medium. If we write

$$\Delta = E(x)^{-1}\sum_{j=1}^{n}A_j(x)D_j\,,$$

(0.1) can be written as

$$D_tu-\Lambda u=f(t, x)\,. \tag{0.1$'$}$$

When $E(x)=I$ (identity matrix) the equation (0.1)′ is represented as

$$D_tu-\Lambda^0u=f(t, x)\,, \tag{0.2}$$

where

$$\Lambda^0=\sum_{j=1}^{n}A_jD_j\,.$$

Now if we assume that f has the form

$$-f(t, x)=e^{i\lambda t}f(x) \qquad \lambda\in\boldsymbol{R}^1\backslash\{0\}$$

and that the solution of (0.1)′ has the same form