JOURNAL OF INTEGRAL EQUATIONS
AND APPLICATIONS
Volume 10, Number 2, Summer 1998

ON THE USE OF GREEN'S FUNCTION IN SAMPLING THEORY

M.H. ANNABY AND A.I. ZAYED

Dedicated to the memory of Professor A.H. Nasr

ABSTRACT. There are many papers dealing with Kramer's sampling theorem associated with self-adjoint boundary-value problems with simple eigenvalues. To the best of our knowledge, Zayed was the first to introduce a theorem that deals with Kramer's theorem associated with Green's function of not necessarily self-adjoint problems which may have multiple eigenvalues, but no examples of sampling series associated with either non-self-adjoint problems or problems with multiple eigenvalues were given. We define two classes of not necessarily self-adjoint problems for which sampling theorems can be derived and give a sampling theorem associated with Green's function of self-adjoint problems. Finally, we give some examples that illustrate our technique.

1. Introduction. Consider the boundary-value problem

$$l(y) = \sum_{k=0}^{n} p_k(x) y^{(n-k)}(x) = \lambda y, \qquad a \le x \le b, \quad \lambda \in \mathbf{C}, \tag{1.1}$$

$$U_\nu(y) = \sum_{j=1}^{n} \alpha_{j\nu} y^{(j-1)}(a) + \beta_{j\nu} y^{(j-1)}(b) = 0, \qquad \nu = 1, 2, \dots, n, \tag{1.2}$$

where $p_k(x)$ are sufficiently smooth functions [**12**, p. 6] on $[a, b]$, $p_0(x) \neq 0$ for all $x \in [a, b]$, and U_ν are n linearly independent forms of

Received by the editors on September 9, 1997, and in revised form on December 5, 1997.
1991 AMS *Mathematics Subject Classification.* 41A05, 34B05.
Key words and phrases. Boundary-value problems, Kramer's sampling theorem.
The first author, who is on leave from Department of Mathematics, Faculty of Science, Cairo University, Giza, Egypt, wishes to thank the Alexander von Humboldt foundation for the grant IV-1039259.