Coercive solvability of degenerate system of second order difference equations

Kordan N. OSPANOV [1], Assylbek ZULKHAZHAV [1]

[1] *Faculty of Mathematics and Mechanics, L.N. Gumilyov Eurasian National University, Ȧstana, Kazakhstan*
E-mail: ospanov_kn@enu.kz, ȧsilbekpin@mail.ru

Abstract: We consider the following infinite system of second order difference equations:

$$l_0 y = -\Delta^{(2)} y + R\Delta y = F, \tag{1}$$

where $y = \{y_j\}_{j=-\infty}^{+\infty}$, $\Delta y = \{\Delta y_j\}_{j=-\infty}^{+\infty} = \{y_{j+1} - y_j\}_{j=-\infty}^{+\infty}$, $\Delta^{(2)} y = \{\Delta(\Delta y_j)\}_{j=-\infty}^{+\infty} = \{y_{j+1} - 2y_j + y_{j-1}\}_{j=-\infty}^{+\infty}$, $F = \{F_j\}_{j=-\infty}^{+\infty}$ and $R = (r_{i,j})_{i,j=-\infty}^{+\infty}$ is a real matrix.

Coercive solvability of the diagonal system

$$-\Delta^{(2)} y_j + \hat{R}\Delta y_j + Q y_j = F_j(\ j \in \mathbf{Z}),$$

where $\hat{R} = diag\{r_j,\ j \in \mathbf{Z}\}$, $Q = diag\{q_j,\ j \in \mathbf{Z}\}$ was discussed in [1]. In the case where oscillation of the sequence $\{r_j\}_{j=-\infty}^{j=+\infty}$ satisfies some conditions, we proved that this system is unique and coercive solvable.

In this paper, for difference system (1), we obtain some sufficient conditions of the solvability in the space of all square-summable real sequences. We also will establish the coercive estimate for its solution.

Keywords: difference system, solvability, coercive estimates of solutions

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References

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