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$$\varphi(R_{e_i}) = g_2 + \sum_{j=1}^{n}(-\alpha_{ij} + \beta_{ij})R_{e_j}$$

for all $1 \le i \le n$, *where the determinants of matrices* (α_{ij}) *and* $(-\alpha_{ij} + \beta_{ij})$ *are not zero,* f_2, g_2 *are any homogeneous elements of degree 2 of the algebra* $U(A)$.

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WEIGHTED ESTIMATES OF DISCRETE BILINEAR HARDY TYPE OPERATORS

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Let $1 < p, s, q < +\infty$; let $u = \{u_n\}, v = \{v_n\}, w = \{w_n\}, n \in N$ be positive sequences of real numbers. Let $f = \{f_n\}_{n=1}^{\infty}, g = \{g_n\}_{n=1}^{\infty}$ be arbitrary sequences of nonnegative numbers. In this work we study the characterization problem for the bilinear discrete Hardy type operators of the following form

$$\left(\sum_{n=1}^{\infty} u_n^q \left(\sum_{i=n}^{\infty} a_{in} f_i\right)^q \left(\sum_{i=n}^{\infty} g_i\right)^q\right)^{\frac{1}{q}} \le C\left(\sum_{i=1}^{\infty} |v_i f_i|^p\right)^{\frac{1}{p}} \left(\sum_{i=1}^{\infty} |w_i g_i|^s\right)^{\frac{1}{s}}, \qquad (1)$$

where C is the best constant in (1) and does not depend on f and g; (a_{ij}) is non-negative matrix with elements $a_{ij} \ge 0$, when $i \ge j \ge 1, a_{ij} = 0,$ when $i < j$ and which satisfy the Oinraov's condition: there exists $d \ge 1$ such that

$$\frac{1}{d}(a_{ik} + a_{kj}) \le a_{ij} \le d(a_{ik} + a_{kj}), \forall i \ge k \ge j \ge 1 \qquad (2)$$

When $a_{ij} = 1, i \geq j \geq 1$ the inequality (1) was investigated in [1], [2] for various combinations of the parameters p, s and q.

Our main result reads as follows:

Theorem 1. Let $1 < p, s \leq q < +\infty$ and the elements of matrix (a_{ij}) satisfy condition (2). Then the inequality (1) holds if and only if $A = max\{A_1, A_2\} < \infty$, where

$$A_1 = \sup_{m\geq 1}\left(\sum_{i=1}^{m} u_i^q\right)^{\frac{1}{q}}\left(\sum_{j=m}^{\infty} a_{jm}^{p'} v_j^{-p'}\right)^{\frac{1}{p'}}\left(\sum_{i=m}^{\infty} w_i^{-s'}\right)^{\frac{1}{s'}}, \qquad (3)$$

$$A_2 = \sup_{m\geq 1}\left(\sum_{i=1}^{m} a_{mi}^q u_i^q\right)^{\frac{1}{q}}\left(\sum_{j=m}^{\infty} v_j^{-p'}\right)^{\frac{1}{p'}}\left(\sum_{i=m}^{\infty} w_i^{-s'}\right)^{\frac{1}{s'}} \qquad (4)$$

Moreover, where $A \approx C$(A is approximately equal to C) is best constant in (1).

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SEPARABILITY OF THE UNBOUNDED THIRD-ORDER DIFFERENCE OPERATOR

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We consider the following third-order difference equation

$$ly = -\Delta^{(3)} y_i + a_i \Delta y_i = a_i^{\alpha} f_i, \quad f_i \in l_p, \ \ i \in Z = \{0, \pm 1, \pm 2, \pm 3, \dots\}, \qquad (1)$$

where

$$y = \{y_i\}_{i=-\infty}^{+\infty},$$

$$\Delta_- y = \{\Delta_- y\}_{i=-\infty}^{+\infty} = \{y_i - y_{i-1}\}_{i=-\infty}^{+\infty},$$

$$\Delta_+ y = \{\Delta_+ y\}_{i=-\infty}^{+\infty} = \{y_{i+1} - y_i\}_{i=-\infty}^{+\infty},$$

$$\Delta^{(3)} y_i = \Delta\left(\Delta^{(2)} y_i\right) = \Delta\{y_{i+1} - 2y_i + y_{i-1}\}_{i=-\infty}^{+\infty} = \{y_{i+1} - 3y_i + 3y_{i-1} - y_{i-2}\}_{i=-\infty}^{+\infty},$$

and $0 \prec \alpha \prec 1, \quad a_i \geq \varepsilon \succ 0$.

In this work we will set that equation has unique solution and for it the estimate