Problem 9. «Crypto noise»

Bob obtained from Alice the ciphertext $c = (c_1, c_2, \ldots, c_{20})$ that is a vector over $\mathbb{Z}_{16}$. He knows that the initial message is a vector $m = (m_1, m_2, m_3, m_4)$ over $\mathbb{Z}_{16}$. He also provided the information that for the ciphertext it holds $c = mA + e \pmod{16}$ where A is a 4×20 integer matrix

$$A = \left(\begin{array}{cccc|cccccccccccccccc} 2 & 2 & 1 & 1 & -1 & 0 & 3 & 7 & -2 & -2 & -1 & -1 & -2 & -2 & -1 & -1 & -2 & -2 & -1 & -1 \\ 2 & 1 & 2 & 1 & -2 & -1 & -2 & -1 & -1 & 1 & 2 & 7 & -2 & -1 & -2 & -1 & -2 & -1 & -2 & -1 \\ 1 & 2 & 1 & 2 & -1 & -2 & -1 & -2 & -1 & -2 & -1 & -2 & 0 & 0 & 3 & 6 & -1 & -2 & -1 & -2 \\ 1 & 1 & 2 & 2 & -1 & -1 & -2 & -2 & -1 & -1 & -2 & -2 & -1 & -1 & -2 & -2 & 0 & 1 & 2 & 6 \end{array}\right)$$

and $e = (e_1, e_2, \ldots, e_{20})$ is an unknown «noise» vector with elements from the set $\{-1, 0, +1\}$.

Let $c = (4, 2, 15, 11, 7, 4, 9, 5, 7, 2, 9, 4, 2, 14, 14, 13, 0, 8, 4, 12)$ and $\sum_{i=1}^{20} e_i^2 = 14$, provide the most efficient way to restore the initial message m (or any possible candidates for it).

Remark. The points for the solutions obtained via brute force or any computer algebra systems will be reduced.