Step-1

Solvable equation; an equation is said to be solvable if value of constant of coefficient can be easily computed and then solving the equation by manipulation.

Let $c_1v_1 + c_2v_2 + c_3v_3 + c_4v_4 = 0$

$$c_1\begin{bmatrix}1\\1\\0\\0\end{bmatrix}+c_2\begin{bmatrix}1\\0\\1\\0\end{bmatrix}+c_3\begin{bmatrix}0\\0\\1\\1\end{bmatrix}+c_4\begin{bmatrix}0\\1\\0\\1\end{bmatrix}=\begin{bmatrix}0\\0\\0\\0\end{bmatrix}$$

That is;

$c_1 + c_2 = 0$ â€¦â€¦ (1)

$c_1 + c_4 = 0$ â€¦â€¦ (2) $c_2 + c_3 = 0$ â€¦â€¦ (3) $c_3 + c_4 = 0$ â€¦â€¦ (4)

Step-2

Now solve, by subtract $(1)-(2)$

$$\begin{aligned}(c_1 + c_2) - (c_1 + c_4) &= 0\\ c_2 - c_4 &= 0\\ c_2 &= c_4\end{aligned}$$

From (4),

$$\begin{aligned}-c_4 - c_3 &= 0\\ c_3 &= -c_4\end{aligned}$$

So,

$$\begin{aligned}c_1 &= -c_4\\ c_2 &= -c_1\\ &= c_4\end{aligned}$$

Therefore, $\boxed{\begin{aligned}c_1 &= -c_4\\ c_2 &= c_4\\ c_3 &= -c_4\end{aligned}}$.

Step-3

Therefore $-c_4v_1 + c_4v_2 - c_4v_3 + c_4v_4 = 0$

If $c_4 = 1$ then $-v_1 + v_2 - v_3 + v_4 = 0$

Therefore v_1, v_2, v_3, v_4 are dependent.

They do not span R^4 because dimension of R^4 is $\boxed{4}$.

Step-4

Now, $(0,0,0,1)$

$c_1v_1 + c_2v_2 + c_3v_3 + c_4v_4 = (0,0,0,1)$

Now, $(0,0,0,1)$

$c_1v_1 + c_2v_2 + c_3v_3 + c_4v_4 = (0,0,0,1)$

That is;

$c_1 + c_2 = 0$ â€¦â€¦ (5)

$c_1 + c_4 = 0$ â€¦â€¦ (6)

$c_2 + c_3 = 0$ â€¦â€¦ (7)

$c_3 + c_4 = 1$ â€¦â€¦ (8)

Equation â€“ (5) â€“ Equation â€“ (6)

$c_2 - c_4 = 0$

Equation â€“ (3) â€“ Equation â€“ (4)

$c_2 - c_4 = -1$

Therefore this is not possible to find c_2, c_4.

Hence the equation is $\boxed{\text{not solved}}$.