Slide #3. Idea for the proof of the lemma.

($\Longleftarrow$) Suppose $\ell = 4$ rows of H add up to zero, say,

$$\overrightarrow{h_1} + \overrightarrow{h_3} + \overrightarrow{h_4} + \overrightarrow{h_6} = \overrightarrow{0}.$$

The latter statement is equivalent to

$$\underbrace{(1,0,1,1,0,1,0,\ldots,0)}_{=v} \cdot \underbrace{\begin{bmatrix} --\overrightarrow{h_1}-- \\ --\overrightarrow{h_2}-- \\ --\overrightarrow{h_3}-- \\ --\overrightarrow{h_4}-- \\ --\overrightarrow{h_5}-- \\ --\overrightarrow{h_6}-- \\ \vdots \end{bmatrix}}_{=H} = \overrightarrow{0}.$$

The above means that $v = (1,0,1,1,0,1,0,\ldots,0)$ is a codeword and $\mathrm{wt}(v) = 4$.

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($\Longrightarrow$) If v is a codeword of weight $\ell = 5$ with ones in positions, say, $1,3,4,7$ and 9, then from $v \cdot H = \overrightarrow{0}$, it follows that

$$\overrightarrow{h_1} + \overrightarrow{h_3} + \overrightarrow{h_4} + \overrightarrow{h_7} + \overrightarrow{h_9} = \overrightarrow{0}.$$

That is, the five rows, namely, 1, 3, 4, 7, and 9 of H add up to zero.