

Solution

a) Denote the output image by $g(i,j)$, then:

$$g(i, j) = -4f(i, j) + f(i+1, j) + f(i-1, j) + f(i, j) + f(i, j+1) + f(i, j-1)$$

$$g(i, j) = -5 \left[f(i, j) - \frac{1}{5} [f(i+1, j) + f(i-1, j) + f(i, j) + f(i, j+1) + f(i, j-1)] \right]$$

$$g(i, j) = -5 [f(i, j) - \bar{f}(i, j)]$$