Question 6

Case I:
Shifted rectangle 30 pixels in the left direction and 70 pixels to the downwards.
This results in impulse in IFFT of Cross power function at pixel position A(231,331).

For zero displacement in the rectangle, impulse occurs at O(301,301).

A(231,331) is 70 pixels above O and 30 pixels in right (exactly opposite of displacement).

Case 2:
Same result as above. (Impulse is weaker than the previous case however max value occurs at same index)

The complexity of the algorithm:

Time to compute fft + Time to compute elementwise-product of Matrices + time to compute ifft + time to compute max = O(n^2 log(n)) + O(n^2) + O(n^2 log(n))+ O(n^2)

Comparison with pixel-wise image comparison

The complexity of this algorithm is O(n^4). Since one of the images has to be translated over space and compared with another image.

Hence the time complexity of this algorithm is greater than that of the previous one.