Part I. Harris Corner Detection

a. Under different kernel sizes of Gaussian filter
   - blurred images: The image of kernel size = 10 is obviously much more blurred than kernel size = 5.
   - detected edges: The edges of kernel size = 10 is more blurred than kernel size = 5, and the amount of edges are less than kernel size = 5.
b. Under different window sizes of structure tensor
   - The corners detected under window size = 30 X 30 is much roughly than window size = 3 X 3, thus, we can find out that size 30 X 30 detects much more corners than size 3 X 3.
c. The effect of non-maximal suppression
   - The amount of corners detected by structure tensor decrease after applying the NMS to the image, since NMS suppresses the non-maximal pixels.
d. The results of rotated and scaled image
   - Harris detector is rotation-invariant and scale-variant. The image can find the same features even if it is rotated, so we can see that the rotated image still has the same corners detected. Yet the features changed after the image was scaled, thus, the corners detected changed or missed as the image shown in the output result.

Part 2. Image Sensing Pipeline (ISP)

a. Why sensors need to use CFA (Color Filter Array) such as Bayer patterns to store color information?
   - Color filters are needed because the typical photosensors detect light intensity with little or no wavelength specificity, and therefore cannot separate color information.
   - CFA allows only a single color to be captured at every pixel, separates RGB colors for sensors.
b. Give/Describe two other methods which can perform de-mosaicing
   1. Variable Number of Gradients (VNG): One of algorithms of “pixel correlation within an image” method. It computes gradients near the pixel of interest and uses the lower gradients (representing smoother and more similar parts of the image) to make an estimate.
   2. Pixel Grouping (PPG): One of algorithms of “pixel correlation within an image” method. It uses assumptions about natural scenery in making estimates. It has fewer color artifacts on natural images than the Variable Number of Gradients method.

c. Image results

d. The reason of adding synthetic noise to clean image on RAW domain instead of RGB domain

- Adding synthetic noise to clean image on RAW domain only performs noise of different intensity on the image. It will not affect the color.