Quiz 1, CSE340/ECE350, Monsoon 2021
Date and Time: 10th Sept, 10:30 AM to 11:50:59 AM
Total marks: 7.5

Instructions: In some questions you will have to make suitable assumptions. In your answer sheet, clearly state the assumptions. You must show all the steps required to arrive at the answer.

No questions will be responded during the quiz.

Upload your scanned solution in the classroom.

Q1. Find whether histogram equalization is a linear system or not.   [1]

Q2. What is the maximum number of pixels corrupted using salt and pepper noise that can be removed using a median filter? Explain it using a pixel neighborhood.   [1]

Q3. Suppose an image I is histogram equalized to obtain I_{eq}. I_{eq} is then matched to the histogram of another image J. Find a single transfer function which can do this processing. [1]

Q4. Find the full convolution result $g(x,y) \ = \ I(x,y) * w(x,y)$
$I(x,y) = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}, w(x,y) = \begin{bmatrix} -1 & \mathbf{0} & 1 \end{bmatrix}$
Bold indicates origin. For the output of convolution, clearly mark the origin.   [1.5]

Q5. Suppose there is an unknown true image I. I is corrupted by addition of white noise and M such corrupted observations are available. The noise is distributed according to uniform distribution $U(a,b)$. Assume the noise to be continuous. It is desired to obtain an estimate of I using the average of corrupted observations. Let this estimate be G. Find the mean and variance of G at a particular coordinate.   [1.5]

Q6. Given the following three blurred images-
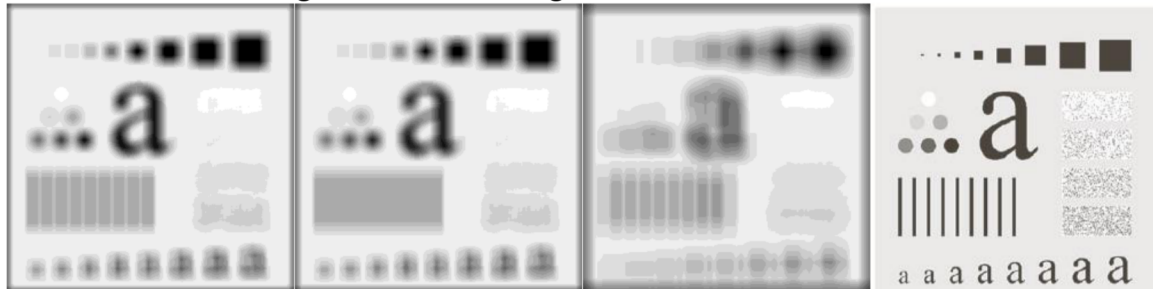
The leftmost (first) image is blurred using a 23x23 box filter, the second using 25x25 box filter and the third using 45x45 box filter. The vertical bars on the first and third image show separation between them. However, the second image does not show any separation between the vertical bars even though the it uses a 25x25 box filter. The original image is in far right. Explain the reason.   [1.5]