Problem 1
1) Write code to perform filtering operation of an image \( f \) in the space domain (using convolution). The image \( f \) has \( M \) by \( N \) pixels and the size of the mask \( (H) \) should not be larger than 25 elements. Do not use built in functions for this question, write your own code.
2) Write code to read an image of your choice and convert it to gray level.
3) Use your convolution code to perform filtering on the image using the following filter:
\[
\begin{bmatrix}
0 & 1 & 0 \\
1 & -4 & 1 \\
0 & 1 & 0
\end{bmatrix}
\]
(1)
4) Show and discuss your results.

Problem 2
1) Write code to read an image of your choice and convert it to gray level.
2) Add salt and pepper noise to the image. Use command `imnoise` or other equivalent functions.
3) Perform median filtering on the image of question 2) (the image with salt and pepper noise).
4) Show and discuss your results.

Problem 3
Use histogram, histogram properties or other methods to read the hidden secret message in the image of figure 1. The image is available online.

Problem 4
Consider the image shown below:
\[
\begin{bmatrix}
252 & 41 & 63 & 52 \\
252 & 45 & 45 & 26 \\
236 & 41 & 52 & 36 \\
230 & 245 & 255 & 240
\end{bmatrix}
\]
(2)
We use the following filter:
\[
\begin{bmatrix}
0 & 1 & 0 \\
1 & 2 & 1 \\
0 & 1 & 0
\end{bmatrix}
\]
(3)
1) Perform convolution of the image by hand for the center pixels only:
\[
\begin{bmatrix}
45 & 45 \\
41 & 52
\end{bmatrix}
\]
(4)
2) Use function `conv2` to verify your results (this function will give you a bigger matrix).