# Lab 3. Task 1- preparation task Template for answers

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1. **2D Fourier spectrum**

**1)** Spec1:

**En bild som visar grå, svart, linje, rymden**

**2)** Spec2:

**3)** Do you notice any differences between and ? How does shifting the image affect the Fourier spectrum?

There is no difference between Spec1 and Spec2. The information we gain from

Log(1+abs(F)) doesn’t say anything about the phase of the spectrum. So when we do circshift we won’t get any new information.

**4)** Spec3:



**5)** Do you notice any differences between and ? How does rotation in the spatial domain affect the Fourier spectrum? (Please ignore any distortions caused by the black area added around the image after rotation.)

Rotating the image in the spatial domain will also rotate the spectrum image. Edges have moved to other locations in the image. However the magnitude is still unaffected.

**6)** Spec4:



**7)** Compare with and explain how the elimination of the vertical bars affected the spectrum.

Removing information from the image in the spatial domain will have an effect on the spectrum image. We can see that the horizontal line has less intensity compared to the horizontal line on the first spectrum image. Considering the vertical bars were removed we conclude that the horizontal line represents frequencies that are vertical lines in the spatial domain.

**8)** Discuss what would happen to the spectrum if the horizontal bars were eliminated from .

Vertical components would removed from the spectrum.

**9)** Spec5:

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**10)** Compare with and explain how the elimination of the diagonal bars affected the spectrum.

1. **Period and Frequency**

**11)** Where would the three dominant peaks appear if the image is transposed, meaning the vertical bars become horizontal?

*Still one in the middle, and one on top of the image.*

**12)** What is the frequency of the stripes in ? Where would the three dominant peaks in the spectrum for this image appear?

*Frequency = 1/p which for v4 gives ¼ = 0.25*

**13)** What is the frequency of these stripes? Where would the three most dominant peaks in the spectrum for this image appear?

1. **The importance of the spectrum and the phase angle**

**14)** E1\_E2:

**15)** E2\_E1:

**16)** Based on your visual analysis of the results from Problems 14 and 15, which has a greater effect on the structure of an image: the spectrum or the phase angle?

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