Read through the whole exam first.
The exam consists of 4 exercises. The points for each question is marked.

I recommend to use a new sheet of paper for each exercise.
You may write in English or Norwegian

**EXERCISE 1: Techniques (20 p)**

A. Name 3 types of image format (3 p)
B. Name a method of first and second order texture analysis (4 p)
C. What is meant by spatial resolution of a digital image ? (4 p)
D. What is a low pass filter ? (3 p)
E. What is the effect of a low pass filter on an image ? (3 p)
F. What is the formula that gives the relation between number of bits and number of gray levels ? (3 p)

**EXERCISE 2: Finding objects (30 poeng)**

A. What is the area and the perimeter of an object ? (5 p)
B. What is a chain code ? (5 p)
C. What is the difference between a 4- and 8-connected chain code ? (5 p)
D. What is watershed and how can it be used to segment objects in an image ? (5 p)
E. What is meant by "shrink and grow" of an object ? (5 p)
F. What is a Canny filter ? (5p)

**EXERCISE 3: Histograms (25 poeng)**

A. Explain how the histogram of an 8-bits image is constructed
B. Make a drawing and explain the histogram of an image that is: (5p)
    a. underexposed
    b. correctly exposed
    c. overexposed
C. Explain the process of histogram equalisation, write the formula if you remember it ( 5p)
D. What is the effect of histogram eualisation ? (3 p)
E. What is meant by thresholding of an image ? (3p)
F. Explain how the histogram of an 8-bit image can be reduced to for example a 32 bin histogram (4p)
G. Describe briefly the principle of of Outsu thresholding (5p)

**EXERCISE 4: Spectral image analysis (25 p)**

A) What is the difference between an RGB image and a hyperspectral image ? (5p)
B) What kind of information can you get from a hyperspectral image that you can not get in an RGB image ? (5p)
C) What is the difference between supervised and unsupervised classification ? (5p)
D) Give an example of a supervised classification algorithm (2p)
E) Imagine that you have a hyperspectral image with tablets containing the active ingredient paracetamol. In between there are some tablets that are fake and do not contain paracetamol. You are given the task to detect the fake tablets. Describe the procedure you would try to carry out this task. (8 p)