MIT-3216 Measurement Based on Digital Image I   28-Jan-2008

1. Explain terms shortly

    a)   Measurement
    b)   Digital image
    c)   Autocorrelation function
    d)   Colinearity condition (draw a sketch also)

2. 2-D Fourier transforms and 2-D WOSA spectra

    a)   How do you interpret the 2-D discrete Fourier transform of 2-D data?
    b)   What is the connection between 2-D discrete Fourier transform and 2-D spectrum?
    c)   What does the power spectrum describe after trend removal?
    d)   Explain how the 2-D WOSA spectrum is computed form 2-D data (image)?

3. Image registration

    a)   Explain what is template matching and how it is performed for 2-D data?
    b)   How is sub-pixel matching (registration/positioning) usually done?

4. Color and gray scale images

    a)   What is the difference between color image and multi-channel images?
    b)   What is a color filter array, for example, Bayer-matrix and how is the full RGB image formed from it?

5. Error sources in image based measurements

    a)   What two main classes of errors are present in every measurement system?
    b)   Sketch a block diagram from image based measurement system
    c)   Explain what kinds of error sources are present in each block. Try also to classify them to one or both of the main classes.