**AS-74.3114 Computer Modelling**

**Exam 7.5.2015 (RT) 12:00-14:00**

**Instruction**

Summary of lecture notes on 6 A4 pages is allowed to use in examination. If you add this material to the current examination answer we evaluate your understanding by this material also and give you 0…5 bonus points in dependence on your Summary.

The maximum of points is 5+23+22+10 = 60.
50 points is required for grade 5.
15 points (without bonus points) is required to pass exam with grade 1.

**Discrete time system (23p)**

- How is defined a White noise (name its properties) (3p)
- Write general time series models for ARMA, AR and MA processes (3p)

- Write general system for description of partially observed Conditionally Gaussian processes in discrete-time case (3p)
- What kind of assumptions this Conditionally Gaussian system must satisfy? (3p)
- If it satisfies, what follows? (3p)

- Write in details the state estimation algorithm for a Conditionally Gaussian system (5p)
- What is the Innovation process and how it helps in testing of the filtering results? (3p)

**Continuous-time system (22p)**

- How is defined a Wiener process (name its properties) (3p)
- Explain metrics of a Wiener process. How this metrics is taken into account in approximation of the stochastic differential equations? (3p)
- Give examples of linear and nonlinear Ito's equations (3p)

- Write general system for description of partially observed Conditionally Gaussian processes in continuous-time case (3p)

- Write the formula for Ito's rule; explain all its components. For what the Ito's rule is? (5p)
- Use Ito's rule to calculate the average value and variance of geometric Brownian motion? (5p)

**Probability density (10p)**

- Write the Fokker-Plank equation for computing of probability density in the case of Wiener process. Initial condition is Gaussian (5p)

- Write the Kolmogorov backward equation for computing of probability density in the case of geometric Brownian motion. Terminal condition is Gaussian (5p)