S-114.2601 Introduction to Bayesian Modelling (L) **Exam 12.1.2010**

Use equations to clarify your answers if necessary.

1. Describe briefly the following terms and what they are used for:

   a) Semi-conjugate prior (2p)

   b) Marginal distribution (2p)

   c) Observed information (2p)

2. Markov chain Monte Carlo (MCMC)

   a) How one can estimate how many MCMC samples are needed? (3p)

   b) Describe briefly Metropolis algorithm. What are the factors that contribute to its performance and how its performance can be increased? (3p)

3. Describe shortly alternative ways to choose priors that try to encode ignorance. (6p)

4. Discuss Bayesian model checking and evaluation. (6p)

5. Decision analysis

   a) Describe shortly the Bayesian decision analysis process (principle, terms, and steps) (2 p)

   b) A part of an aircraft engine can be given a test before installation. The test has only a 75% chance of revealing a defect if it is present, and the same chance of passing a sound part. Whether or not the part has been tested it may undergo an expensive rework operation which is certain to produce a part free from defects. If a defective part is installed in the engine the loss is L. If the rework operation costs L/5 and 1 in 8 of parts are initially defective, calculate how much you could pay for the test and determine all the optimum decisions. (4p)