AS-74.3101 Dynamic Systems
Exam 14.12.2011 (RT, JP)

1. Briefly explain the following concepts (give examples where possible):

   a) AR model (1 p.)
   b) Distributed parameters model (1 p.)
   c) Model order (1 p.)
   d) Markov type system (1 p.)
   e) Component balance (1 p.)

2. Laplace analysis

   a) The differential equation model of a system is known. Explain the steps involved in utilizing the Laplace transform for analyzing the system response. (3 p.)
   b) Form the transfer function corresponding to the model $\ddot{y} + a_1\dot{y} + a_2 y = b_1 u$. (2 p.)

3. Electrical circuits

   In the depicted electrical circuit, the input variable is the voltage $u_0(t)$ and the output variable is the voltage $u_C(t)$. Derive the differential equation(s) that describe(s) the system and write the model in state-space form. (5 p.)
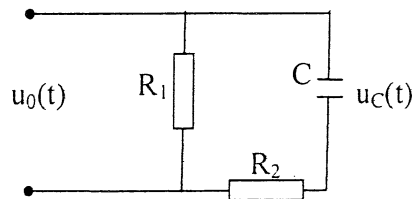
4. Stochastic systems. How does the modelling of stochastic systems differ from modelling deterministic systems? Why are stochastic models needed? How are stochastic models useful especially in the context of decision making?   (5 p.)

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