ELT-63306 Modeling of Physiological Systems,

Exam 8.1.2014

1. Explain briefly;
   a) What are physiological homeostatic systems and servosystems ? *regulaatiori*
   b) How modeling of physiological systems (e.g. model of the heart) differs from modeling of manmade objects (e.g. car engine)
   c) Explain what are model, analog and analog model?

2. a) Compare Empirical model (black box model) versus theoretical model. How these modeling methods work in modeling physiological systems?
   b) Figure below left is measurement of lung volume as function of pressure. Describe how you would use the data to build a black box model? Is it possible to build other kinds of models using the data?
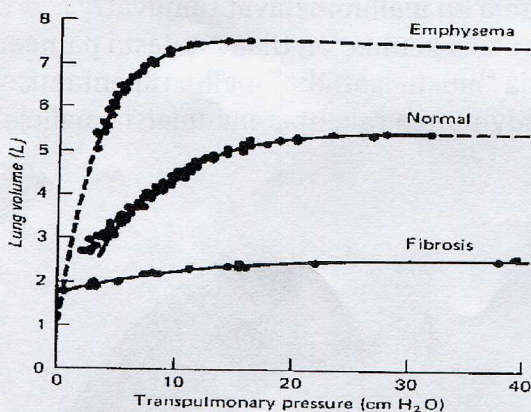

Figure 34-7. Static expiratory pressure-volume curves of lungs in normal subject and subjects with severe emphysema and pulmonary fibrosis. (Modified, with permission, from Pride NB, Mackem PT: Lung mechanics in disease. Pages 659–692 of Vol III, Part 2, of: *Handbook of Physiology.* Section 3: *The Respiratory System.* Fishman AP [editor]. American Physiological Society, 1986.)
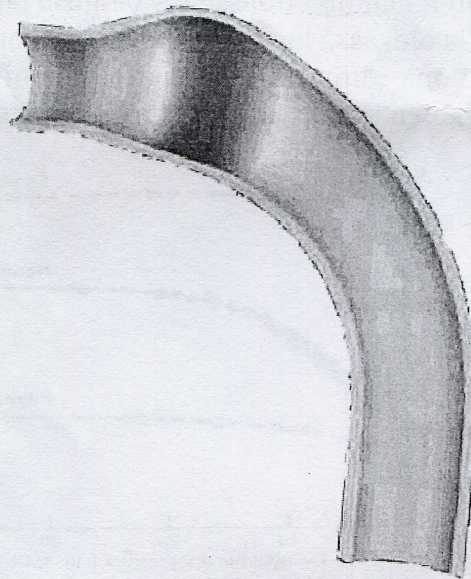
3. In the picture above right there is a FEM computational flow model of the blood pulse in aorta (deformation+ pressure in grey scale). Describe a) how this kind of model can be constructed (what data needed), and b) what kind of boundary conditions are required to solve this model?