ELT-63106  Measurements of Physiological Systems

Exam 30.1.2017 (Juha Nousiainen)

Use of calculators is NOT allowed.

Answer all questions. All questions yield totally 20 points at the maximum. To pass the exam, you must get at least 40% of the maximum points (= 8 points) in ALL problems AND at least 40 points in total. Use clear handwriting. Aim at analytical and well structured answers. Compact answers are preferred instead of long non-stop text answers. Use graphics to illustrate your answers if possible.

1.a) Describe (model) the equivalent circuit models of the tissue bioimpedance.

b) Consider some practical and theoretical issues related the bioimpedance measurements in general and in impedance cardiography in particular.

2. About the measurement of the biopotentials.

a) Explain briefly principal differences between the standard 12-lead ECG system and Frank vectorcardiographic VCG lead system.

b) Explain briefly principal differences between the measurement of spontaneous EEG and evoked EEG response.

c) Explain briefly the importance of consideration of the electrode-skin interface as regards the biopotential (ECG or EEG) measurement.

3. Describe the principles of the following measurements. Consider also limitations and benefits of these methods compared to other alternative methods to measure the same quantity.

a) Thermodilution method of cardiac output.

b) Indirect non-invasive measurement of arterial blood pressure measurement method.

4. Describe briefly in few sentences how you can measure and determine the following physiological parameters:

a) Oxygen saturation of blood.

b) Depth of anesthesia.

c) Volume-flow loop of ventilation.

d) Arterial pressure pulse and pulse wave velocity.