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BME-2106 Measurement and analysis of physiological systems

Exam 15.11.2010

Calculators are not allowed.

Answer all questions. To pass the exam, you must get at least 40% of the maximum points in ALL problems AND at least 25 points in total. Use clear handwriting. Draw a margin to each page.

Aim at **analytical** and **well structured** answers. **Compact** answers are preferred instead of long answers. Use **graphics** to illustrate your answers.

1. Plethysmography. (maximum 15 points, minimum requirement to pass 6 points)
 - a) **Explain** the idea of plethysmographic measurements. What can be measured and by what kind of techniques or methods.
 - b) **Consider** one clinically important application (what is measured and how, possible limitations and advantages with respect to alternative methods) of plethysmographic measurement of **circulatory** system.
 - c) **Consider** one clinically important application (what is measured and how, possible limitations and advantages with respect to alternative methods) of plethysmographic measurement **respiratory** system

2. **Consider** the application of **infrared radiation** to measure physiological quantities. **Consider** first the measurement principles in general. Then **consider** two important applications of infrared methods: (1) respiratory gas concentration measurements and (2) non-invasive blood-gas monitoring. (maximum 15 points, minimum requirement to pass 6 points)

3. ECG (maximum 20 points, minimum to pass 8 points)
 - a) In the recording of the ECG with the standard 12-lead system, what are in your opinion the most **critical components in the ECG recording system**, to which you should pay a special attention. Consider and analyse the problems from the diagnostic interpretation point of view (so that the doctors can make the diagnosis based on the recorded ECG). It is not enough to list the components or problems but you need to analyse them and give a solution to the observed critical problems.
 - b) The **diagnostics information** provided by the 12-lead ECG recording is somehow limited. **Explain** shortly, how is the diagnostic information of standard ECG limited. **Give** several methodological solutions, how one can extend the information obtained from the heart, compared to the standard 12-lead recording in the hospital. (which limitation is solved and how?)