

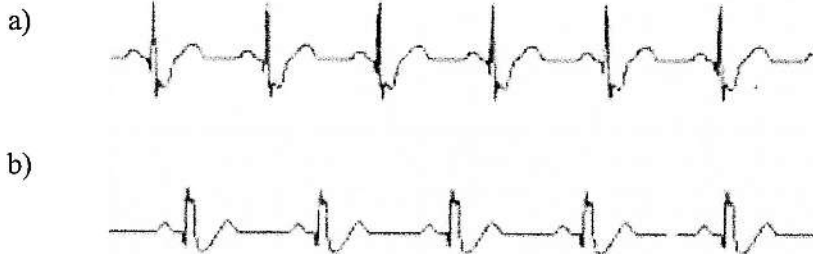


BME-1156 Biomedical Engineering A

Exam: 30.11.2009 9:00-12:00

Please answer all questions in English. Please keep your handwriting/printing readable and drawings understandable. The exam is worth 100 points.

- 1) Explain the resting membrane potential and include an equation to describe it. (15 points)
- 2) Draw, label, and explain both stages of the bioinstrumentation amplifier. (15 points)
- 3) Draw and briefly explain the waveform corresponding to two cycles of a typical ECG signal and indicate the following waves and periods: (a) the P, QRS, and T waves; (b) the RR interval; (c) atrial contraction; (d) atrial relaxation; (e) ventricular contraction; and (f) ventricular relaxation. (2.5 each x 6 = 15 points)
- 4) Which one is left bundle branch block (LBBB) and which one is right bundle branch block (RBBB)? Explain your reasoning. (15 points)



- 5) A wheelchair needs a foldable lap table that will mount on it. a) Prepare a list of questions that will guide your detailed analysis of this design solution (4 pt). b) Write a sample set of constraints for the design for a person with normal healthy arms and thorax using a manual wheelchair. (4 pt) c) Write a sample set of constraints for the design for a person with weak arms with limited arm movement using a motorized wheelchair. (4pt) d) Could you make the same design solution for both cases? Explain why or why not. (8pt) (4+4+4+8 = 20 points)
- 6) You are leading a research team studying clinical gait. You are in charge of designing a new laboratory to study clinical gait disorders (patients that have problems walking and running because of illnesses, accidents, birth defects, etc.). Design your laboratory so that it has two ways to monitor and study the patients. Draw, label, and explain how you build your laboratory. Briefly mention WHY you choose these setups. (20 points)