

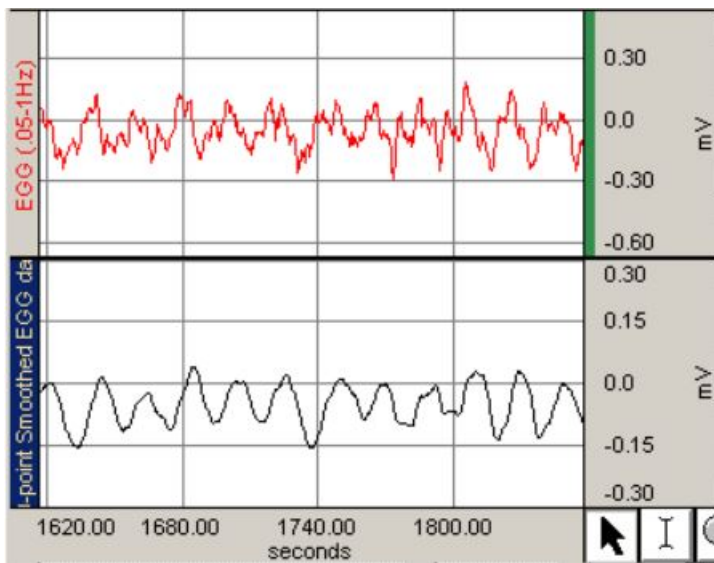
EE 4BD4 MIDTERM TEST

Fall 2014

October 27, 2014

Question 1 and 2 are worth 15, question 3 is worth 20. Answer all questions on test sheets

1. An electrician who is standing in a pool of water grabs a live 500V 60 Hz line with his bare left hand. Give an electrical equivalent circuit of the current path through his body and describe each component. (hint: this is an electrode question). What are the physical and physiological effects of the current flow? Is he in greater danger if his hands are oily, or if they are sweaty? Why?
2. You have designed a measurement system to record a hypothetical electrophysiological signal (amplitude $0 - \pm 100 \mu\text{V}$, bandwidth 5Hz – 1000Hz) from the body using surface electrodes. Describe 3 possible types of noise in your recorded signal, its origin and how your design has removed or minimized each.
3. The following figure shows the raw recording (top) and smoothed (bottom) trace of the electrogastrogram (surface skin recording of the smooth muscle of the stomach – not the EMG of your skeletal muscles overlying the stomach).



Design an instrumentation system from transducers to data acquisition by a computer that gives you the bottom trace. Use block diagrams to represent your system with the function and specifications for each block. In your design consider patient safety and sources of possible noise.