

BME331: Physiological Control Systems

Lab 2 – Prelab

1. Explain the concept of frequency response.

Frequency response is the quantitative measure of the output spectrum of a system in response to a stimulus. It is used to characterize the dynamics of a system. It is a measure of magnitude and phase of the output as a function of frequency.

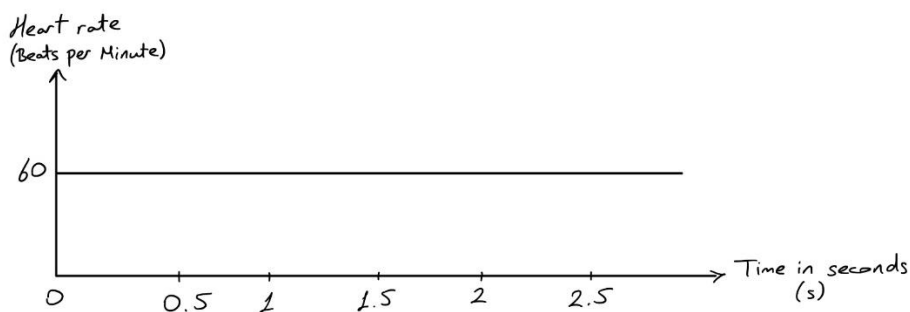
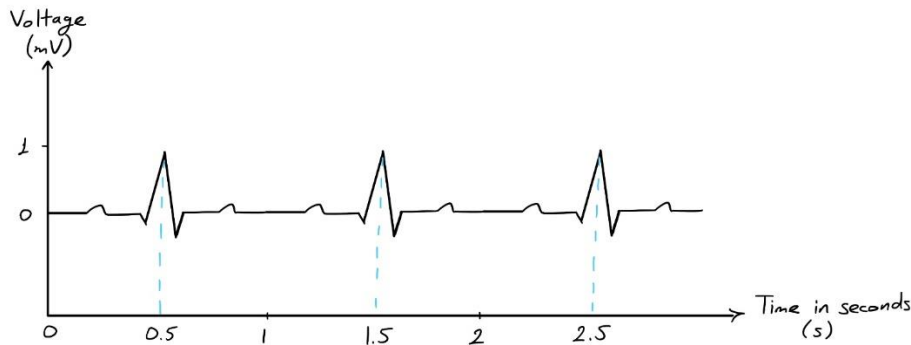
2. Define the word “vagal” and explain its relationship to the autonomic nervous system.

The meaning of “vagal” is of, relating to, mediated by, or being the vagus nerve. The vagus nerve is responsible for the regulations of internal organ functions (digestion, heart rate, respiratory rate) as well as vasomotor activity, and certain reflex actions (coughing, sneezing, swallowing, vomiting). The vagus nerve is a major component of the parasympathetic nervous system which constitutes the autonomic nervous system, with the sympathetic nervous system.

3. Explain why it is preferable to compute the inter-beat interval using the QRS complex of the ECG, rather than the P or T waves.

Ventricles contain more muscle mass than the atria, which results QRS complex to be considerably larger than the P wave on ECG, when these muscles are contracted. Although it is possible to compute the inter-beat interval using the P or T waves, QRS complex is preferred because as it is visibly larger, therefore easier to analyze the interval between two beats.

4. Sketch an ECG signal in which the inter-beat interval is always the same. Draw a plot showing the instantaneous heart rate of this ECG as a function of time. Be sure to label all axes.



5. Sketch an ECG signal in which the inter-beat interval is NOT always the same (you can choose how it varies). Draw a plot showing the instantaneous heart rate of this ECG as a function of time. Be sure to label all axes.

