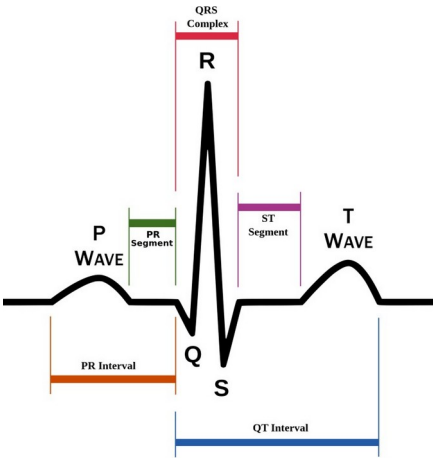
Project Proposal: ECG Circuit Experiment

Introduction

Electrocardiography (ECG) is a technique used to measure the electrical activity of the heart. The ECG signal has distinct characteristics that help in analyzing heart function. The amplitude of the signal typically ranges from 0.5 mV to 5 mV, while its frequency falls within 0.05 Hz to 150 Hz. A single cardiac cycle lasts approximately 0.8 seconds, corresponding to a normal heart rate of around 75 beats per minute (bpm).



ECG Waveform Components

- P Wave: Atrial depolarization (contraction of atria)
- QRS Complex: Ventricular depolarization (contraction of ventricles)
- T Wave: Ventricular repolarization (relaxation of ventricles)
- PR Interval: Time taken for electrical impulse to travel from atria to ventricles
- ST Segment: The period between ventricular depolarization and repolarization

Significance of Study

The ECG signal is typically weak and susceptible to noise, requiring specialized circuitry for amplification and filtering. This experiment provides a practical understanding of biomedical signal processing and analog circuit design. It has applications in medical instrumentation, wearable health monitoring devices, and embedded healthcare systems.

ECG Amplifier Design

The experiment will involve designing an ECG amplifier consisting of following sections:

- Amplify small signal differential voltage produced by cardiac activity.
- Implement an op-amp-based feedback system to reduce common-mode noise.
- Low pass filter is used to eliminate high- frequency noise.
- To suppress supply frequency 50 Hz (noise), Notch filter is used.

Conclusion:

By successfully implementing the ECG amplifier circuit, this project will demonstrate how analog circuit design can be applied in biomedical engineering. The results will validate the effectiveness of the designed amplifier and filtering stages in extracting clean ECG signals for medical analysis.