Circuit Simulation Project

Title : Design and Implementation of Instrumentation Amplifier.

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Problem Statement:

To design, simulate, and validate an Instrumentation Amplifier using the eSim tool ensuring high gain, high input impedance, and low output impedance for accurate low-level signal measurement.

Theory/Description:

An Instrumentation Amplifier (IA or In-Amp) is a type of differential amplifier that is specifically designed for high-precision signal measurement applications. It is widely used in biomedical signal processing (ECG, EEG), industrial sensor interfacing, and low-level signal amplification due to its high gain accuracy, low noise, high input impedance, and excellent common-mode rejection ratio (CMRR).

Theory of Operation

An instrumentation amplifier typically consists of **three operational amplifiers (Op-Amps)** arranged in a **two-stage configuration**:

- The **first stage** consists of **two buffer amplifiers** (Op-Amp 1 and Op-Amp 2) with high input impedance to prevent loading the signal source.

- The **second stage** is a **differential amplifier** (Op-Amp 3) that subtracts the signals from the two inputs and provides the final amplified output.

Circuit Diagram:
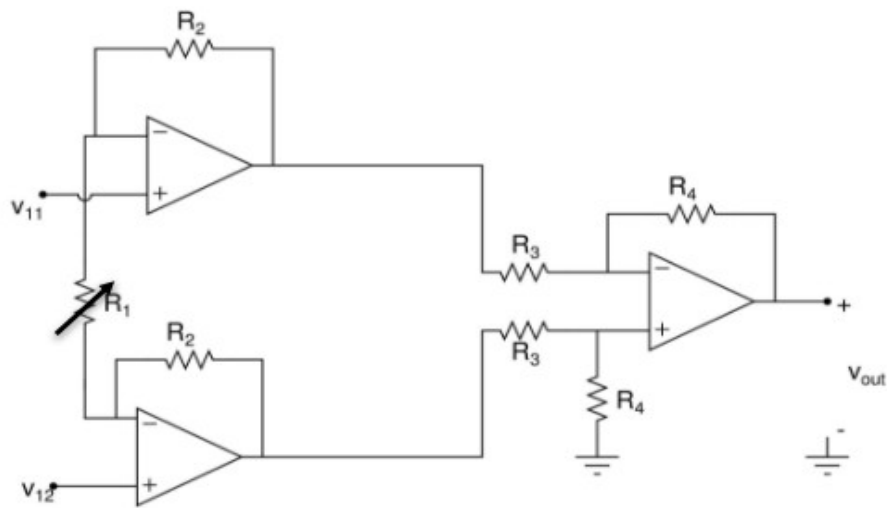
Expected waveforms:
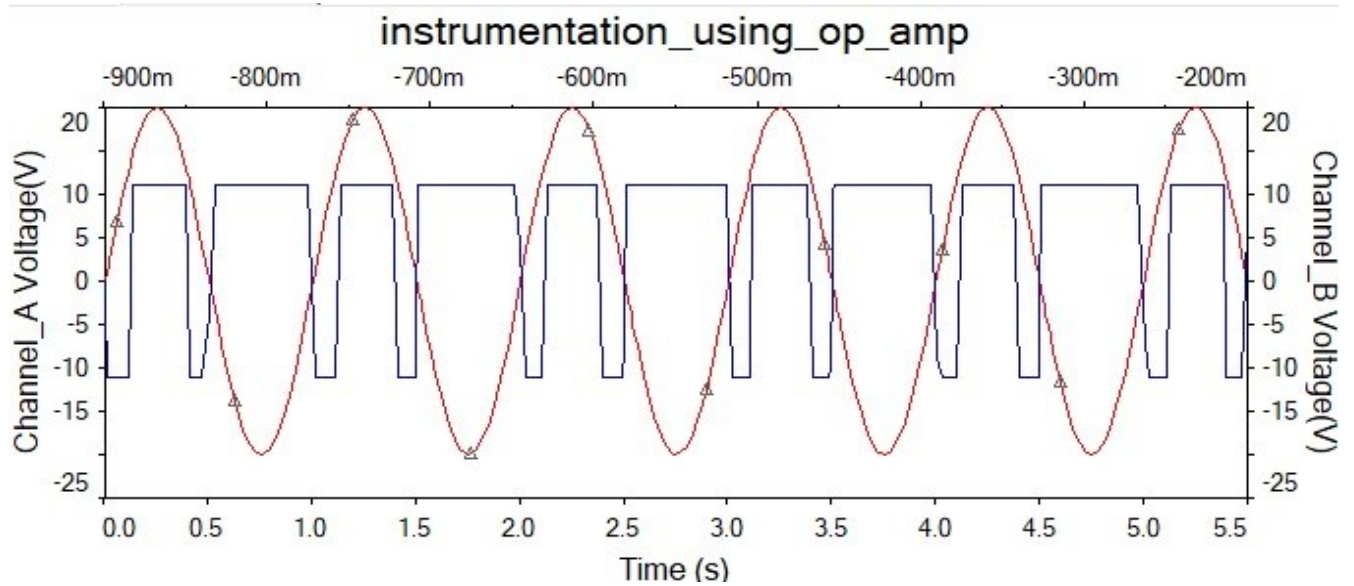
Sources:
Title of the paper: Design and Performance analysis of Instrumentation Amplifier at Nanoscale.
Name of the Journal: International journal of Advance Reasearch ,Ideas And Innovations and technology.
Author: Dr.M.Nizamuddin
Source Link:https://www.ijariit.com/manuscript/design-performance-analysis-instrumentation-amplifier-nanoscale/