Assignment CA3a

**Known:**

Table I Force sensor specifications

Table

Description automatically generated

Diagram, engineering drawing, schematic

Description automatically generated

Figure 1 Block diagram of an instrumentation amplifier

The input range of the ADC is from -10 to 10 V.

**Target:**

**Analysis this force sensing application and design the amplifier gain and the gain resistor**

Based on force sensor specifications I choose **safe overload** as max range of sensor output.

Range of sensor output:

Sensitivity:

Voltage range of Sensor output:

So, the amplifier needs amplify

into

amplifier gain:

Assuming V1 is non inverting input and according to virtual short and Virtual Open to Dummy theory can get this equation:

And then

Amplifier Analysis:

This kind of amplifier named instrumentation amplifier has many great features including very low DC offset, low drift, low noise, very high open loop gain, very large common mode rejection ratio, and high input impedance. Because of these characters, this kind of amplifier can be used to amplify the force, temperature or some other sensitive sensor measurement. There are many modified versions based on this amplifier according to different needs. The application of it is very wide.