1. A pressure sensor outputs -2mV when the pressure is 30psi and +13mV when the pressure is 150psi. The input range for the analog-to-digital converter is 0-10V, where 0V corresponds to 30psi and 10V corresponds to 150psi.

   (a) Design the interface circuit.

   Gain = ☐

   Bias = ☐

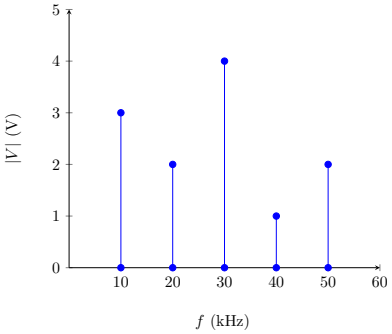
   (b) What does the interface circuit output when the sensor voltage is +6mV?

   V_{out} = ☐

2. An Analog-to-Digital Converter (ADC) has a sampling frequency of 30kHz, what is the maximum input frequency allowed before aliasing occurs?

   f_{max} = ☐

3. Given the following amplitude spectrum for an analog signal being applied to an ADC, what is the minimum sampling frequency required to avoid aliasing? What V_{max} and V_{min} would you recommend to avoid clipping with your ADC?



$f_s =$

$V_{min} =$

$V_{max} =$

4. Perform the following number base conversions

(a) 81_{10} $\xrightarrow{\text{8-bit binary}}$

(b) 65_{10} $\xrightarrow{\text{8-bit binary}}$

(c) 11110101_2 $\xrightarrow{\text{Decimal}}$

(d) 01101110_2 $\xrightarrow{\text{Decimal}}$

5. Given a 4-bit ADC with $V_{min} = 0V$, what V_{max} is required to get a voltage resolution of $\frac{1}{4}V$?

$V_{max} =$ [ ]

6. Given an ADC with $V_{max} = 10V$ and $V_{min} = 0V$, how many bits would be required to get a voltage resolution less than 2mV? Recall this needs to be an integer value.

b = [ ]