**Assignment:** Design a system that will maintain the speed of a motor at 110 ± 15 RPM. The following information may be helpful in planning your design.

- The speed of the motor, measured in revolutions per minute (RPM), is determined by the voltage applied to the input of the motor. This relationship for the no-load condition is shown in Figure 1.

- The motor contains a tachometer that produces a sinusoidal output with a peak-to-peak voltage proportional to the speed of the motor. This relationship is illustrated by the following equation,

  \[ \text{RPM} = 27.23 \times (V_{pp} - 4) \]

- A digital-to-analog converter outputs a discrete analog voltage that is proportional to the ratio of the input digital count to the maximum number of counts. The maximum output voltage, \( V_o \), depends on the full-scale voltage, \( V_{fs} \),

  \[ V_o = V_{fs} \times \frac{\text{count}}{2^n} \]

  Where \( n \) is the number of D/A input bits, and count is the binary value of the input to the D/A converter at a given time. You may assume \( V_{fs} = 15.0 \text{volts} \) and \( n = 8 \).

![Graph](image)

**Figure 1:** Applied DC Motor Voltage vs. Motor RPM