

1. What is the difference between a continuous-time and discrete-time system?
  - Continuous-time systems have a theoretically infinite time resolution. There is no minimum unit of time that cannot be divided further where a result can't be calculated.
  - Discrete-time systems operate only on periodic intervals.
2. How does fixed-point represent decimal values?
  - A virtual decimal point is placed in a known position in the variable's bits. Any bits above the decimal point represent integer values, the others below represent fractional values with their values representing  $(2^{-1}) \cdot (0.5)$ ,  $(2^{-2}) \cdot (0.25)$  and so on... Fixed-point is a bit trickier to use with because you manually interpret what is integer and fractional. However, it requires standard integer math operations while giving sub-integer results.
3. In the discrete first-order integral equation in the lab, what does the input value  $x[n]$  represent when used in the integral portion of a PI control system?
  - The error
4. The specific motor used in the lab has a gearbox on the output. What is the internal motor's speed when the output shaft is rotating at 125 RPM?
  - 6,250 RPM
5. How many encoder counts will you get per second at a output shaft rotation of 125 RPM?
  - 400,000 counts
6. How do you control the speed of the motor using the H-Bridge?
  - Using the H-bridge enable pin. When the pin is low the driver is disabled and essentially disconnected from the motor. In this state it doesn't try to stop the motor, it simply isn't providing any more power. By connecting the enable pin to a PWM output, we'll get a very similar output signal from the H-bridge. This amplified PWM signal approximates driving the motor with an analog voltage.
7. What I/O structure types on the STM32F0 are 5V tolerant?
  - FT and FTF