

# TI-RSLK **MAX**

Texas Instruments Robotics System Learning Kit



# Module 9

Quiz: SysTick Timer



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## Q1 SysTick fundamentals

Part a) I/O registers are 32 bits wide, but how many bits wide is the SysTick counter?

Part b) Does the SysTick count down, count up, or can it count either up or down?

Part c) When in the **Count** flag set?

Part d) List the three ways the **Count** flag goes from 1 to 0? I.e., what operations clear the **Count** flag?

## Q2 Create Stepper Motor Output

Let *Time* be an arbitrary time in ms, ranging from 1 to 10000, stored as a shared global variable.

```
uint32_t Time;
```

Write a `C` main program that outputs these waves out Port 4 of the microcontroller. Initialize SysTick and Port 4, the `while(1)` loop of the main program runs over and over without returning.

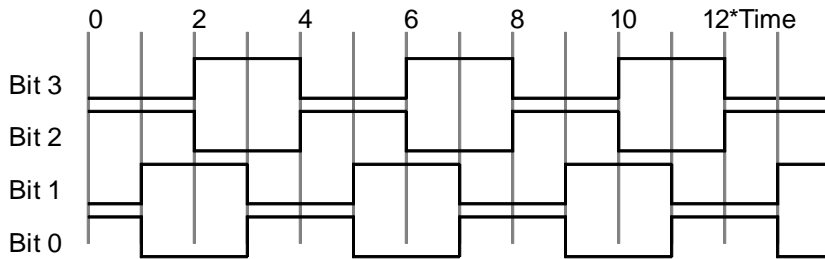


Figure 1. Stepper Motor Output

## Q3 RC model of a long cable

This problem addresses the issue of capacitive loading on a high-speed serial transmission line like SPI. The SPI ports of two microcontrollers are connected with a VERY long cable. We will model this cable as a single resistor in series with a single capacitor, as shown in the figure below.

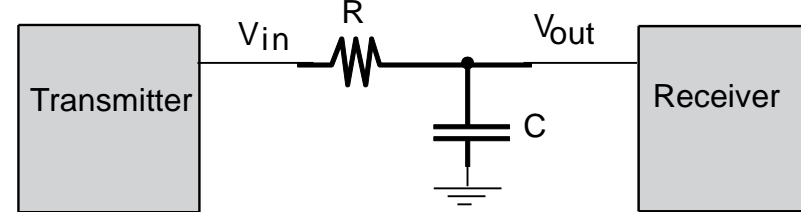


Figure 2. RC model of a cable.

Consider a 3.3-V 100-ns pulse on the output of the transmitter (labeled as  $V_{in}$ )

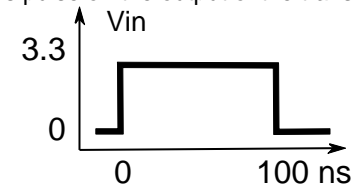


Figure 3. 100-ns pulse.

At time just after 100ns, what effect does the capacitor have on the circuit?

- A) The  $dI/dt$  causes a large voltage spike
- B) The capacitor behaves like a short causing  $V_{out}$  to be zero.
- C) The stored charge on the capacitor is shorted into the transmitter causing a spark
- D) The capacitor prevents data from being transferred and the SPI does not work
- E) The capacitance is polarized so it only affects the circuit at time = 0
- F) The  $dV/dt$  at time 100ns will be about  $3.3V/(RC)$

Make a rough sketch of  $V_{out}$  if  $RC$  is small compared to 100 ns.

Make a rough sketch of  $V_{out}$  if  $RC$  is large compared to 100 ns.

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