HAN'S ROBOT

Recruiting Test

Electrical Engineering

Version 1.00

2020/05/12

Change History

Date	Version	Change	Responsible
2020/05/12	1.00	Initial Version	bro

Content

Introduction

Within our hiring process at Han's Robot Germany GmbH we not only rely on a personal or video meeting with our applicants but also put their skills and capabilities to the test.

Please take this test as a chance to show us your style of work and convince us with the solution you found to the given problem.

This task allows for several solutions that are of different complexity, cost, time needed, and nerd level involved. Since they all have their pros and cons, there is no right or wrong in this – choose the one you like most and show us, what you got!

Problem Description

Imagine a sensor module having the following characteristics:

Table 1: Sensor Module Characteristics

Symbol	Parameter Conditions	Conditions	Min.	Typ.	Max.	Unit
VDD	Supply Voltage	-	1.65	3.3	3.6	V
I	Device Current	VDD = 3.3V	-	4	8	mA
V_{OL}	Output low level voltage for pin	I_{IO} = +2mA VDD = 1.8V	-	-	0.45	V
		I_{IO} = +2mA VDD = 3.0V	-	-	0.45	
V_{OH}	Output high level voltage for pin	I_{IO} = -1mA VDD = 1.8V	VDD – 0.45	-	-	
		I_{IO} = -1mA VDD = 3.0V	VDD – 0.45	-	-	

The sensor module has the following pinout (2x4 pin header, 2.54mm pitch):

Table 2: Sensor Module Pinout

Pin	Name	Signal
1	IO1	Digital Output 1
2	IO2	Digital Output 2
3	IO3	Digital Output 3
4	IO4	Digital Output 4
5	IO5	Digital Output 5
6	TP1	Digital Output 6
7	GND	GND
8	3V3	VDD

The sensor module with its µC and the six output pins shall be connected to six inputs of an industrial PLC system that is operating off a 24V PSU and corresponding logic levels. The PLC system's input circuitry looks like this:

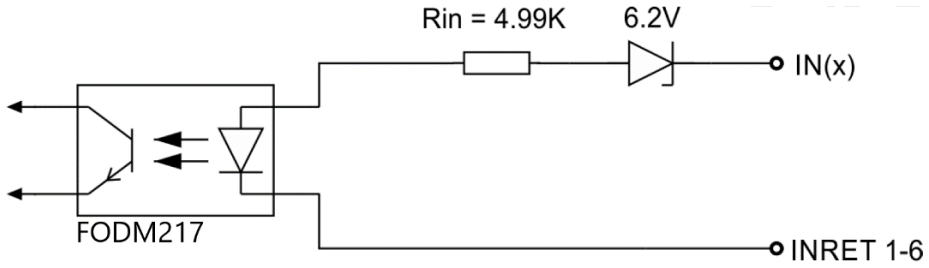

Figure 01: PLC Input Circuit

The PLC system's connector to the sensor module has the following pinout (2x5 pin header, 2.54mm pitch):

Table 3: PLC Sensor Connector Pinout

Pin	Name	Signal
1	IN(1)	Digital Input 1
2	IN(2)	Digital Input 2
3	IN(3)	Digital Input 3
4	IN(4)	Digital Input 4
5	IN(5)	Digital Input 5
6	IN(6)	Digital Input 6
7	INRET	Input Return
8	GND	GND
9	24V	Power out
10	GND	GND

Pin 7 should be bridged to Pin 8.

Task

Design a solution to connect the two systems' IO and power the sensor module off the PLC system's PSU.

The designed solution must fit in a half circle with an OD of 50mm being not higher than 12mm. Since the solution shall be glued on to the sensor module, only the top surface of the half circle is available for components.

Try to find a solution you like and which you think fits the problem in terms of used components and complexity.

The time spent on designing a solution shall not exceed one week – there is no lower time limit though.