KIE4022

Embedded Systems

Sem I, 2020/2021

Assignment-#2

Due Date: 25th Dec 2020 (Submit through SPECTRUM only)

Please work in group (two persons per group).

[20 Marks]

Briefing

You are part of a team developing a simple machine control system, based on an Mbed-enabled microcontroller. The machine has start and stop buttons. When it is started, a motor is powered. The motor must not start if the safety guard is open. The motor must be immediately switched off if the guard is opened, if the stop button is pressed, or if the operating temperature exceeds a certain value. The motor may be restarted if the stop button is released, and/or when the temperature falls to an acceptable value, if of course the guard is closed.

The following inputs and outputs are needed, with proposed logic values.

Push button 1 : User start button; closure = logic 1.
Push button 2 : Stop; closure = logic 1.
Switch 1 : Machine guard sensor; closed condition = logic 1.
Switch 2 : Temperature sensor; excess temperature = logic 1.

LEDs are used to indicate machine status:

LED 1 : Motor is ready to run, i.e. guard is closed, temperature is OK. This LED should flash when machine in "not ready" state.
LED 2 : Motor is running.
LED 3 : Fault condition – guard opened while running, shows for 0.5 s.
LED 4 : Fault condition – excess temperature, shows for 0.5 s.

You are going to write and simulate (*with the Mbed simulator*) a program which meets this need.

a) Sketch out a program structure. There are several valid approaches, for example, a flow diagram.
b) Start write a program and set up your four inputs and four outputs, using GPIOs.
c) Now, working from your sketched program structure, start developing your code. Establish the main structure, and the first sub-loop in the program.
d) When you are happy with your first sub-loop, consider the "ready and waiting" state.
e) Finally, consider the coding for when the motor is running, and the three possible exits from this state.

When you are happy with your code, transfer to the simulator.