RTOS In A Nutsel

short line

# **Challenge**

# Sprint Number (2)

## User story (1):

Use an RTOS project to define two tasks with the following specifications.

1. **Task A:** Sends any text to LCD to be written.
2. **Task B:** Sends any text to LCD to be written.

**Task A** shall print 10 texts (text every 500 ms), And **Task B** shall print 10 texts (text every 1000 ms). When **Task A** starts writing to LCD **Task B** shall not write until **Task A** finishes all the 10 texts and vice-versa.

## User story (2):

Use an RTOS project to define four tasks with the following specifications.

1. **Task A:** Responsible for monitoring push button 1 state.
2. **Task B:** Responsible for monitoring push button 2 state.
3. **Task C:** Responsible for switching an LED ON/OFF.
4. **Task D:** Responsible for monitoring state of LED and printing its state on LCD and which button is currently activating the LED.

When push button 1 is pressed the LED is switched ON as long as it’s pressed and LCD prints current LED state and current push button 1 state. If push button 2 is pressed the LED is switched ON as long as it’s pressed and LCD prints current LED state and current push button 2 state. Only one push button is allowed to be pressed at a time to switch LED ON.

## User story (3):

Use an RTOS project to implement a simple security system which shall contain the following interfaces:

1. LCD.
2. 1 seven segment.
3. 2 push buttons.
4. 2 LEDs.

User shall enter a password (5 digits) which is displayed on LCD, When the user press push button 1 and if password is correct display “Correct password” on LCD and LED 1 is turned on for 2 seconds, Otherwise LCD displays “Incorrect password” and LED 2 is turned ON for 3 seconds, And then ask user to enter password again. User shall be able to enter password using push button 2 that is used to select numbers displayed on 7 segment, When user press push button 2 and releases in a short period (To be defined by developer) the number displayed on 7 segment is incremented (0 -> 9) and if exceeds maximum value it starts again from zero, When user press push button 2 and releases in a long period (To be defined by developer) the number displayed on 7 segment is copied to LCD as a digit from the password.

## Group members number (1, 2 or 4):

1

## SW/HW input environment:

TivaC - Development board.

## Test (If exists):

NA

## Restrictions (peripherals, configurations, what to use and not to use):

1. All applications implemented in this sprint shall use two type of tasks. An **init task** that comes only once to initialize all required interfaces. A **cyclic task** that comes on a fixed period to execute a certain logic.
2. In this sprint LEDs, LCDs, keypad and push buttons are considered individual and independent objects that should have its own task to handle its logic (ex. A task for LCD – A task for LED – A task for another LED – Etc...). A single task shall not handle two objects of the same category.
3. Driver for LCDs, keypad and push buttons shall completely be developed by the student and is allowed only to use the GPIO driver from the TivaWare library.
4. In this sprint configure RTOS **configTICK\_RATE\_HZ** to 1000 HZ, and disable preemption.
5. All task periodicities and priorities are to be assumed by the student to optimize application performance and response time.
6. Use only one or more of these methods (Semaphores – Mutex – Event flags) to achieve tasks synchronization and resource sharing.