Pre-Lab:

- **Short video is available on LMS on SFCs, please watch it first**, in this lab we'll be designing with SFCs

Lab. Work:

- Start a New Project and Pick: BME P58 3020 & BME XBP 0800

Part 1: Traffic Lights (Normal Mode / Night Mode / Service Mode) – SFC

Inputs:

- normal_mode (EBOOL) (This is a button, make it latching from HMI properties (See Fig:2))
- night_mode (EBOOL) (This is a button, make it latching from HMI properties (See Fig:2))
- service_mode (EBOOL) (This is a button, make it latching from HMI properties (See Fig:2))

Output:

- red_light (EBOOL) (this is the red light, when it is 1 that means red light is on, 0 when it is off)
- yellow_light (EBOOL) (this is the yellow light, when it is 1 that means yellow light is on, 0 when it is off)
- green_light (EBOOL) (this is the green light, when it is 1 that means green light is on, 0 when it is off)
- traffic_lights_on (EBOOL) (this variable becomes a 1 when the traffic light system is enabled, 0 otherwise)

HMI:

- Your HMI, should have 3 push buttons, one traffic light (3 color indicator) and one indicator light (single color)

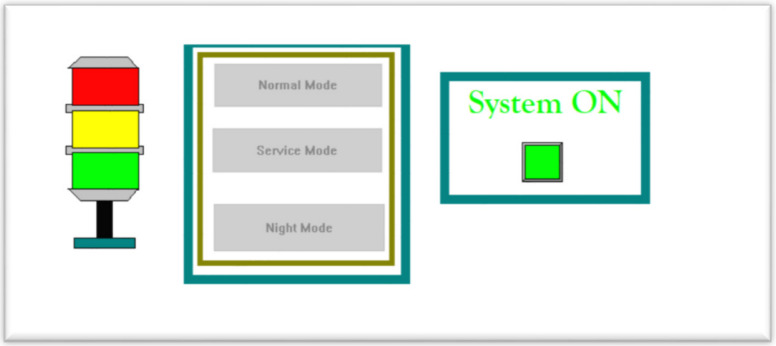


Figure 1-Sample HMI (feel free to be more creative & artistic & colorful than my design)

To make your HMI buttons lathing, please select "with latching" from button properties menu as shown below.

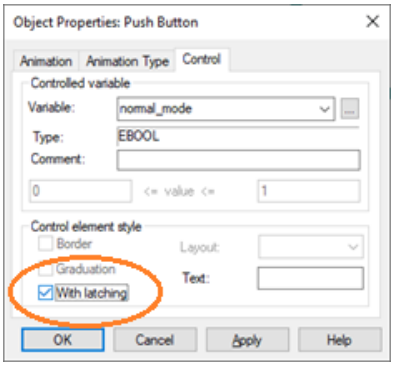


Figure 2- Setting buttons to be latching from HMI Properties Menu

Functionality:

- Upon start, the traffic light system is disabled and all lights are off
- **Normal Mode Operation:**
    - When Night Mode and Service Mode are disabled, if **Normal Mode** button is pressed (and latched automatically) then:
        - Traffic light system is enabled
            - When the system is enabled traffic_lights_on indicator on HMI should be visible
        - The following sequence should be happening on the lights:
            - Only Red_light is on for 5 seconds, then
            - Only Yellow_light is on for 3 seconds then
            - Only Green_light is on for 6 seconds then
            - Whole cycle repeats
    - When **Normal Mode** button is pressed again
        - Traffic light system is disabled
        - All the lights are off
        - Traffic_light_on indicator is not visible
- **Night Mode Operation:**
    - When Normal Mode and Services Mode are both disabled, pressing "**Night Mode**" HMI button puts you in a state where:
        - Yellow_light flashes at 1Hz
        - Red and Green lights are off
        - Traffic_light_on indicator is visible
    - When **Night Mode** button is pressed again
        - Traffic light system is disabled
        - All the lights are off
        - Traffic_light_on indicator is not visible
- **Service Mode:**
    - When Normal Mode and Night Mode are both disabled, pressing "**Service Mode**" HMI button puts you in a state where:
        - Red, Yellow and Green lights are ON for 3 seconds (all together)
        - Red, Yellow and Green lights are OFF for 3 seconds (all together)
        - Whole cycle repeats
    - When **Service Mode** button is pressed again
        - Traffic light system is disabled
        - All the lights are off
        - Traffic_light_on indicator is not visible

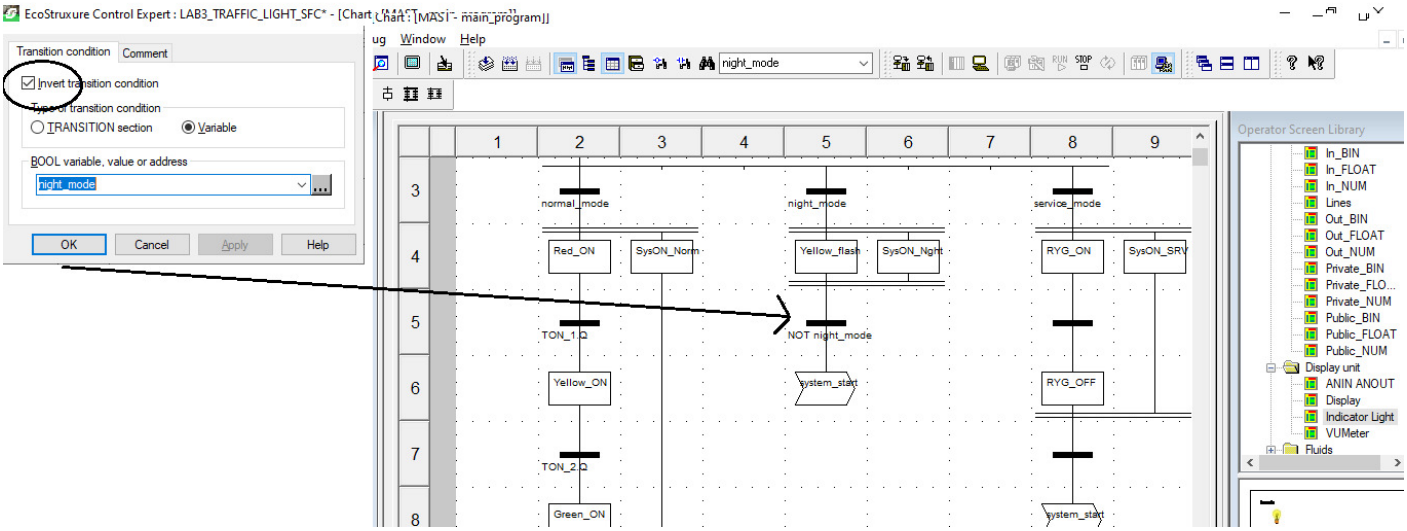
- Feel free to introduce your own variables upon need
- **USE SFC for your design**

Hand In (all in a .zip file):

- Your code
- Screen Shot of your HMI + Screen Shot of your SFC (.pdf them together)

Notes:

1- For your state transitions, you can also look at inverts of your signals as shown below:



2- Your SFC should look like the following