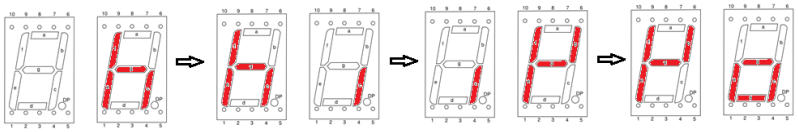
San Francisco Bay University

CE450 Fundamentals of Embedded Engineering
2022 Fall Midterm Exam

1. Based on the Lab5 design, display the shift-in message "hi you did good job" on two 7-segments LEDs from the right to the left periodically as follows



Source Code:

```
#!/usr/bin/env python3
import RPi.GPIO as GPIO
import time

LSBFIRST = 1
MSBFIRST = 2
# define the pins for 74HC595
dataPin   = 11      # DS Pin of 74HC595(Pin11) GPIO17
latchPin  = 13      # ST_CP Pin of 74HC595(Pin13) GPIO27
clockPin = 15       # CH_CP Pin of 74HC595(Pin15) GPIO22
dataPin1   = 37
latchPin1  = 31
clockPin1 = 29
# SevenSegmentDisplay display the character "0"- "Z"
num = [0xc0,0xf9,0xa4,0xb0,0x99,0x92,0x82,0xf8,0x80, 0x90]
alphabet =
[0x88,0x83,0xc6,0xa1,0x86,0x8e,0x90,0x89,0xaf,0xf1,0x8f,0xd7,0xb6,0xab,0xa3,0x8c,0x98,0xaf,0x92,0x87,0xe
3,0x9d,0xc9,0xad,0x8d,0xbc] #0x7f dp
off = 0xff;
def setup():
    GPIO.setmode(GPIO.BOARD)   # use PHYSICAL GPIO Numbering
    GPIO.setup(dataPin, GPIO.OUT)
    GPIO.setup(latchPin, GPIO.OUT)
    GPIO.setup(clockPin, GPIO.OUT)

    GPIO.setup(dataPin1, GPIO.OUT)
    GPIO.setup(latchPin1, GPIO.OUT)
    GPIO.setup(clockPin1, GPIO.OUT)

def shiftOut(dPin,cPin,order,val):
    for i in range(0,8):
        GPIO.output(cPin,GPIO.LOW);
        if(order == LSBFIRST):
            GPIO.output(dPin,(0x01&(val>>i)==0x01) and GPIO.HIGH or GPIO.LOW)
        elif(order == MSBFIRST):
            GPIO.output(dPin,(0x80&(val<<i)==0x80) and GPIO.HIGH or GPIO.LOW)
        GPIO.output(cPin,GPIO.HIGH);
```

```
def loop():
    words = "hi you did good job"
    words = words.replace(" ", "")
    left, right = None, 0
    while True:
        if (right == len(words)):
            right = 0
        GPIO.output(latchPin,GPIO.LOW)
        if(left is not None):
            shiftOut(dataPin,clockPin,MSBFIRST,alphabet[ord(words[left])-ord('a')])  # Send serial data to 74HC595
        else:
            shiftOut(dataPin,clockPin,MSBFIRST,off)  # Send serial data to 74HC595
        GPIO.output(latchPin,GPIO.HIGH)

        GPIO.output(latchPin1,GPIO.LOW)
        shiftOut(dataPin1,clockPin1,MSBFIRST,alphabet[ord(words[right])-ord('a')])  # Send serial data to
74HC595
        GPIO.output(latchPin1,GPIO.HIGH)

        left = right
        right += 1

        time.sleep(0.5)

def destroy():
    GPIO.output(latchPin,GPIO.LOW)
    shiftOut(dataPin,clockPin,MSBFIRST,off)  # Send serial data to 74HC595
    GPIO.output(latchPin,GPIO.HIGH)

    GPIO.output(latchPin1,GPIO.LOW)
    shiftOut(dataPin1,clockPin1,MSBFIRST,off)  # Send serial data to 74HC595
    GPIO.output(latchPin1,GPIO.HIGH)
    GPIO.cleanup()

if __name__ == '__main__': # Program entrance
    print ('Program is starting...' )
    setup()
    try:
        loop()
    except KeyboardInterrupt:  # Press ctrl-c to end the program.
        destroy()
```

Youtube Link:
https://youtube.com/shorts/mA3tVOO0PhA?feature=share