

COS10004: Computer Systems

Lab 7

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16. Provide the lines of code from your lab07_GPIO18.ASM file that achieve the following:

16.1. Establish the base address of the GPIO registers:

```
BASE = $3F000000
GPIO_OFFSET = $200000
move  r0, BASE
orr   r0, GPIO_OFFSET
```

16.2. Program GPIO18 for writing:

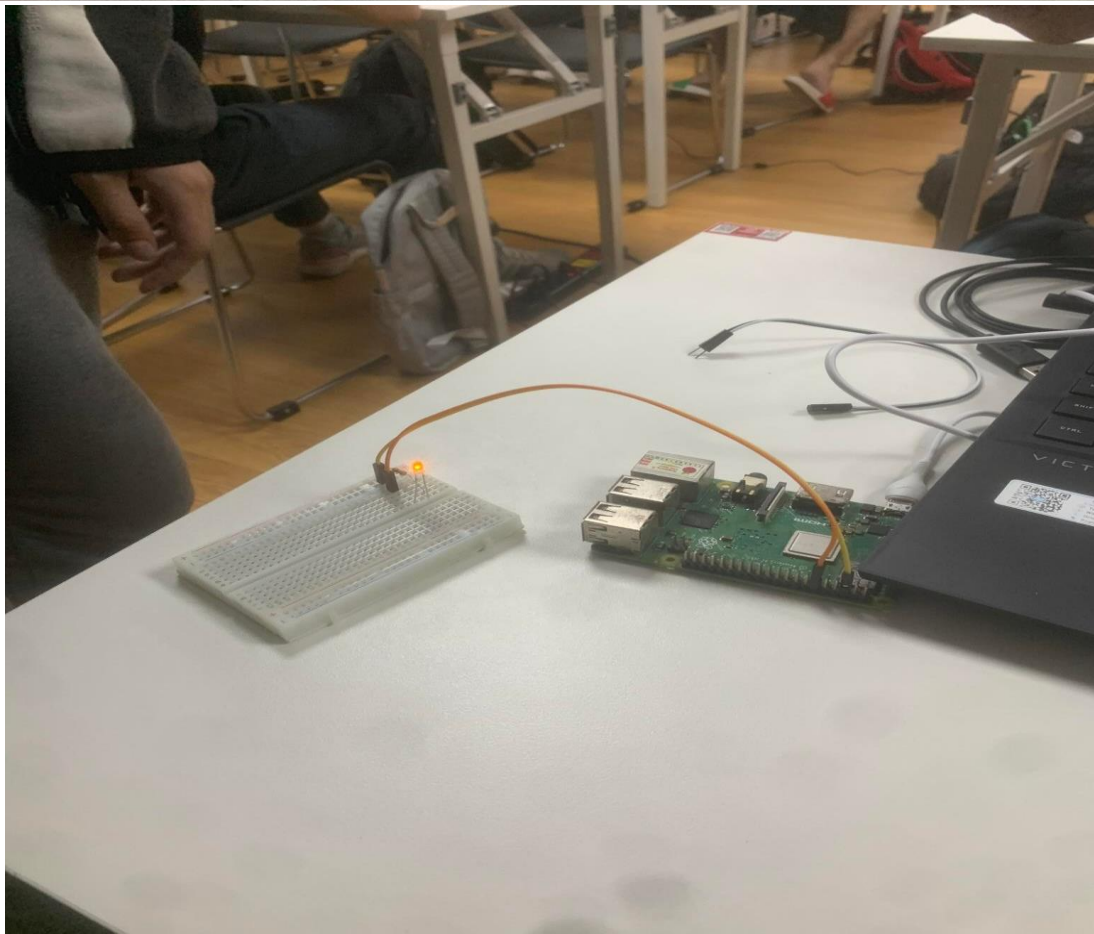
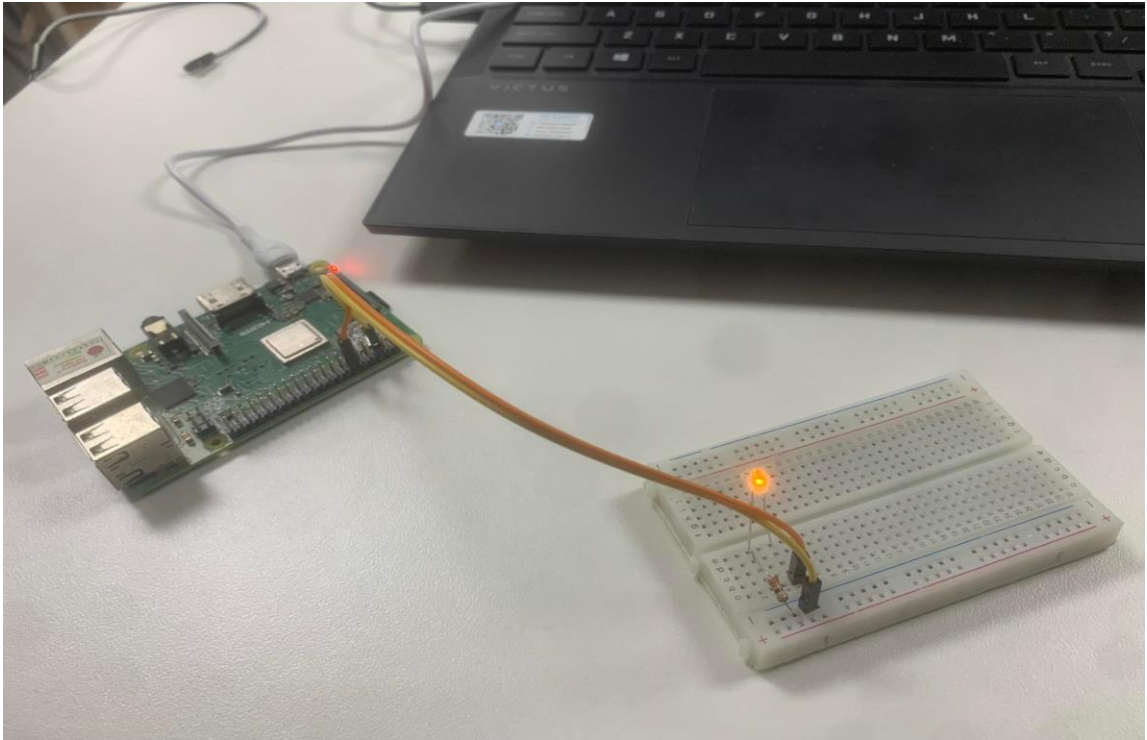
```
mov   r1, #1
lsl   r1, #24
str   r1, [r0, #4] ; finished select GPIO18
```

16.3. Set GPIO18 to ON:

```
mov   r1, #1
lsl   r1, #18
str   r1, [r0, #28] ; 28 = LED ON; 40 = LED OFF
```

16.4. Stop the instruction pointer (program counter) from continuing beyond the executable program code:

```
loop$:
b loop$
```



20. If you are comfortable in your understanding of the GPIO registers then you should be able to answer the following questions:

20.1. What number bit is set (within the associated 32-bit block) to enable GPIO23 for writing: #9

20.2. What is the byte offset from GPIO_BASE that this 32-bit block must be written to in memory: #8

20.3. What number bit is set to set GPIO23 to ON (again within the 32-bit block associated with that GPIO pin): #28

20.4. What is the byte offset from GPIO_BASE that this 32-bit block must be written to memory: 200000

22. Consider how you would program one of the GPIO pins used above to turn off the LED it controls. Choose one of the LEDs to turn off and answer the following:

22.1. Which exact snippet of code will need to change compared to turning the LED on ?

```
mov    r1, #1
lsl     r1, #23
str     r1, [r0, #28]
```

22.2. Provide the alternative code to turn the LED off (again you will need to refer to the GPIO register diagram).

```
mov    r1, #1
lsl     r1, #23
str     r1, [r0, #40]
```