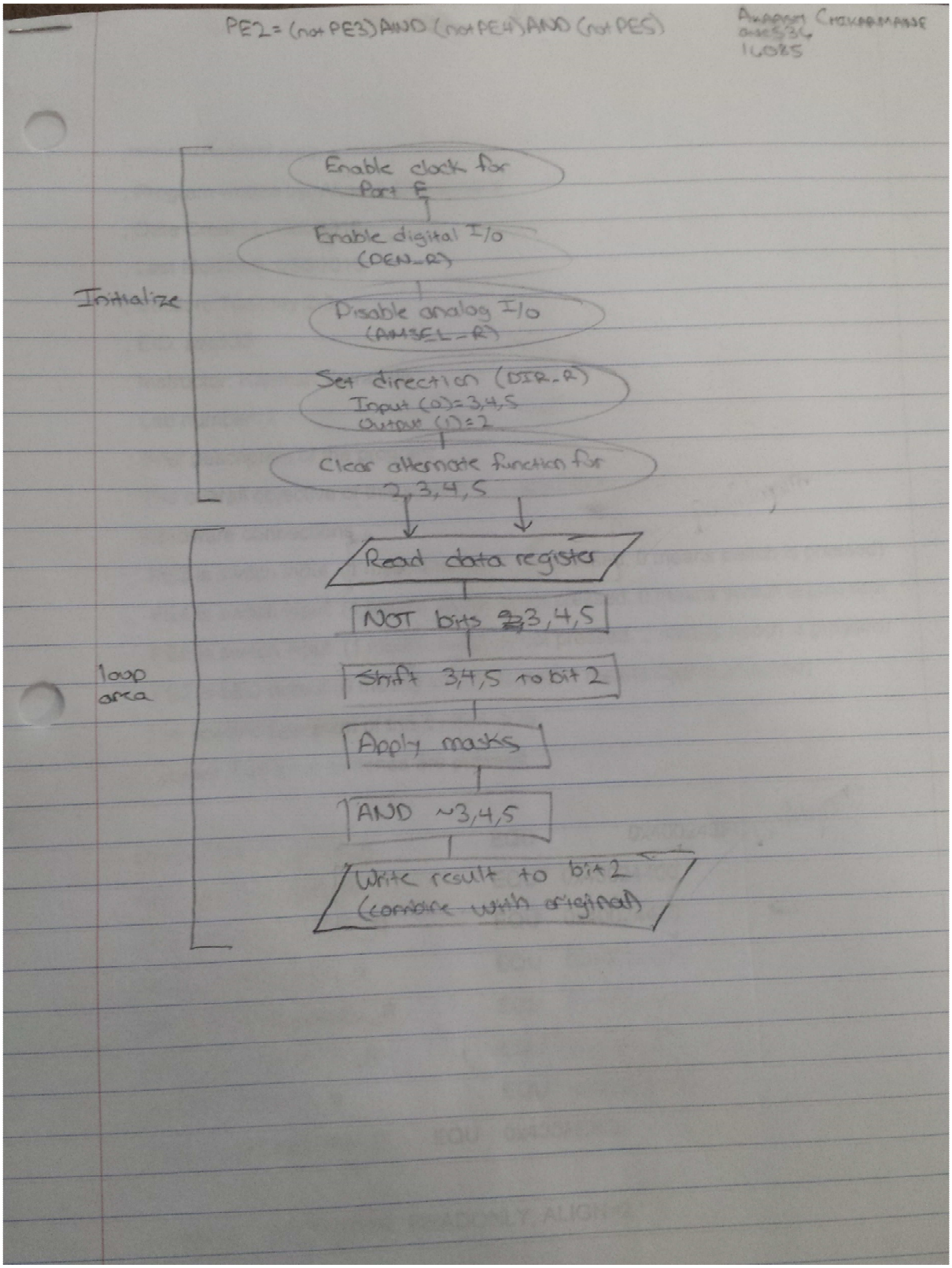
Flowchart


PE2 = (not PE3) AND (not PE4) AND (not PE5)
Initialize
Enable clock for Port E
Enable digital I/O (DEN_R)
Disable analog I/O
Set direction (DIR_R)
Input (0) = 3,4,5
Output (1) = 2
Clear alternate function for 2,3,4,5
loop area
Read data register
NOT bits 3,4,5
Shift 3,4,5 to bit 2
Apply masks
AND ~3,4,5
Write result to bit 2
(combine with original)

Pseudo-Code

```
;R0 = clock
;read clock into R1
;turn on clock E (0001 0000)
;write back in
;stabilize clock

;enable digital I/O
;digital for 2,3,4,5 (0011 1100)

;disable analog I/O (not alternate functions)
;complement of the above one (1100 0011)

;changing the direction
;PE2 is output (0000 0100)
;PE3,4,5 is input (0011 1000)

;alternate functions
;clear AF for PE5,PE4 (0011 1100)

;Copy the data. Modifying R1 then combining with original (R2).
;R1 for bit 3
;R3 for bit 4
;R4 for bit 5

;Move 3 to bit 2 and mask
;Move 4 to bit 2 and mask
;Move 5 to bit 2 and mask

;Absorb(AND) bit 4
;Absorb(AND) bit 5
;Clear the original bit 2
;Combine with original
;write back in

; make sure the end of this section is aligned
; end of file
```

Main Program

```
;****************** main.s ***************
; Program written by: Akaash Chikarmane
; Date Created: 1/22/2016
; Last Modified: 1/30/2016
; Section: Tuesday 2-3
; EID: avc536
; Instructor: Ramesh Yerraballi
; Lab number: 1
; Brief description of the program
; The overall objective of this system is a digital lock
; Hardware connections
;  PE3 is switch input  (1 means switch is not pressed, 0 means switch is pressed)
;  PE4 is switch input  (1 means switch is not pressed, 0 means switch is pressed)
;  PE5 is switch input  (1 means switch is not pressed, 0 means switch is pressed)
;  PE2 is LED output (0 means door is locked, 1 means door is unlocked)
; The specific operation of this system is to
;   unlock if all three switches are pressed

GPIO_PORTE_DATA_R       EQU     0x400243FC
GPIO_PORTE_DIR_R        EQU     0x40024400
GPIO_PORTE_AFSEL_R      EQU     0x40024420
GPIO_PORTE_DEN_R        EQU     0x4002451C
GPIO_PORTE_AMSEL_R      EQU     0x40024528
GPIO_PORTE_PCTL_R       EQU     0x4002452C
SYSCTL_RCGC2_R          EQU     0x400FE108
SYSCTL_RCGCGPIO_R   EQU   0x400FE608

    AREA    |.text|, CODE, READONLY, ALIGN=2
    THUMB
    EXPORT  Start
Start
        LDR R0,=SYSCTL_RCGCGPIO_R   ;R0 = clock
        LDR R1,[R0]                         ;read clock into R1
        ORR R1,#0x10                ;turn on clock E (0001 0000)
        STR R1,[R0]                         ;write back in
        NOP                                 ;stabilize clock
        NOP

        LDR R0,=GPIO_PORTE_DEN_R    ;enable digital I/O
        LDR R1, [R0]
        ORR R1, #0x3C               ;digital for 2,3,4,5 (0011 1100)
        STR R1, [R0]

        LDR R0,=GPIO_PORTE_AMSEL_R          ;disable analog I/O (not alternate functions)
        LDR R1, [R0]
```

```
        AND R1, #0xC3                   ;complement of the above one (1100 0011)
        STR R1, [R0]

        LDR R0,=GPIO_PORTE_DIR_R    ;changing the direction
        LDR R1,[R0]
        ORR R1,#0x04                    ;PE2 is output (0000 0100)
        BIC R1,#0x38                    ;PE3,4,5 is input (0011 1000)
        STR R1, [R0]

        LDR R0,=GPIO_PORTE_AFSEL_R ;alternate functions
        LDR R1,[R0]
        BIC R1,#0x3C                    ;clear AF for PE5,PE4 (0011 1100)
        STR R1,[R0]
loop
        LDR R0,=GPIO_PORTE_DATA_R
        LDR R1,[R0]
        MOV R2, R1                          ;Copy the data. Modifying R1 then combining
with original (R2).
        EOR R1, R1, #0x3C               ;R1 for bit 3
        MOV R3, R1                          ;R3 for bit 4
        MOV R4, R1                          ;R4 for bit 5

        LSR R1, #1                          ;Move 3 to bit 2 and mask
        AND R1, #0x04
        LSR R3, #2                          ;Move 4 to bit 2 and mask
        AND R3, #0x04
        LSR R4, #3                          ;Move 5 to bit 2 and mask
        AND R4, #0x04

        AND R1, R1, R3                  ;Absorb(AND) bit 4
        AND R1, R1, R4                  ;Absorb(AND) bit 5
        BIC R2, R2, #0x04               ;Clear the original bit 2
        ORR R1, R1, R2                  ;Combine with original
        STR R1,[R0]                         ;write back in
         B   loop


    ALIGN      ; make sure the end of this section is aligned
    END        ; end of file
```

Screenshot of LED on