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ELEN 120 Lab

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Lab 8: Matrix I/O

Problem 1:

```
__mainPROC

                bl              lcd_init
endlessbl               lcd_clear

                ldr             r0, ='s'
                bl              let2font
                mov             r1,#1
                bl              lcd_draw

                ldr             r0, ='a'
                bl              let2font
                mov             r1,#2
                bl              lcd_draw

                ldr             r0, ='n'
                bl              let2font
                mov             r1,#3
                bl              lcd_draw

                ldr             r0, ='t'
                bl              let2font
                mov             r1,#4
                bl              lcd_draw

                ldr             r0, ='a'
                bl              let2font
                mov             r1,#5
```

```
                bl              lcd_draw

                ldr             r9, =0xD5552
                ldr             r8, =0

loop    sub     r9, #1
                cmp     r9,r8
                bne     loop

                bl              lcd_clear

                ldr             r0, ='c'
                bl              let2font
                mov             r1,#2
                bl              lcd_draw

                ldr             r0, ='l'
                bl              let2font
                mov             r1,#3
                bl              lcd_draw

                ldr             r0, ='a'
                bl              let2font
                mov             r1,#4
                bl              lcd_draw

                ldr             r0, ='r'
                bl              let2font
                mov             r1,#5
                bl              lcd_draw

                ldr             r0, ='a'
                bl              let2font
                mov             r1,#6
                bl              lcd_draw

                ldr             r9, =0xD5552
                ldr             r8, =0
lpg             sub     r9, #1
                cmp             r9,r8
```

```
                bne     lpg

                b               endless
                ENDP

let2font        PROC
                        EXPORT let2font
                        ;       r0 is an ascii letter a-z (0x41-0x5A or 0x61-7A)
                        ;       return font in r0
                        ;       convert lower to upper - return 0 for out of range

                        cmp     r0, #0x5a
                        subgt   r0, #0x20
range
                        cmp             r0, 0x5a
                        bgt             retr01
                        cmp     r0, #0x41
                        blt     retr01
                        ldr             r2, =letfont
                        sub     r0, #0x41
                        ldrh    r0, [r2,r0,lsl #1]

                        bx              lr

retr0           movgt   r0,#0
retr01          movgt   r1,#0

                        ENDP
                        ALIGN
```

Problem 2:

```
__mainPROC

                bl              lcd_init
endlessbl               lcd_clear

                ldr             r0, ='1'
                bl              num2font
                mov             r1,#1
```

```
                bl              lcd_draw

                ldr             r0, ='2'
                bl              num2font
                mov             r1,#2
                bl              lcd_draw

                ldr             r0, ='3'
                bl              num2font
                mov             r1,#3
                bl              lcd_draw

                ldr             r0, ='4'
                bl              num2font
                mov             r1,#4
                bl              lcd_draw

                ldr             r0, ='5'
                bl              num2font
                mov             r1,#5
                bl              lcd_draw

                ldr             r9, =0xD5552
                ldr             r8, =0

loop    sub     r9, #1
                cmp     r9,r8
                bne     loop

                bl              lcd_clear

                ldr             r0, ='2'
                bl              num2font
                mov             r1,#2
                bl              lcd_draw

                ldr             r0, ='3'
                bl              num2font
                mov             r1,#3
                bl              lcd_draw
```

```
                ldr             r0, ='4'
                bl              num2font
                mov             r1,#4
                bl              lcd_draw

                ldr             r0, ='5'
                bl              num2font
                mov             r1,#5
                bl              lcd_draw

                ldr             r0, ='6'
                bl              num2font
                mov             r1,#6
                bl              lcd_draw

                ldr             r9, =0xD5552
                ldr             r8, =0
lpg             sub     r9, #1
                cmp             r9,r8
                bne     lpg

                b               endless
                ENDP

num2font        PROC
                        EXPORT num2font
                        ;       r0 is an ascii number 0-9 (0x30-0x39)
                        ;       return font in r0
                        ;       Only use last hex digit 0-9; zero out A-F

                        cmp     r0, #0x39
                        bgt             retzero
                        cmp             r0,#0x30
                        blt             retzero1
                        ldr             r2, =numfont
                        sub     r0, #0x30
                        ldrh    r0, [r2,r0,lsl #1]
                        bic     r0,#0x9
                        bx              lr
```

```
retzero     movgt  r0,#0
retzero1    movlt  r0,#0

                   ENDP
```

Problem 3:

```
kpad_scan          PROC                    ;Scan the 4 rows and return the first row # pressed in r0 and the first col # pressed in r1 (>3 for none)
                   EXPORT     kpad_scan
                   push   {lr}
                   mov    r1,r0
                   push   {r1}

                   mov        r0,#0xE
                   bl         kpad_row_read
                   cmp        r0,#0xF
                   movne r0,#3
                   bne        column

                   mov        r0,#0xD
                   bl         kpad_row_read
                   cmp        r0,#0xF
                   movne r0,#2
                   bne        column

                   mov        r0,#0xB
                   bl         kpad_row_read
                   cmp        r0,#0xF
                   movne r0,#1
                   bne        column

                   mov        r0,#0x7
                   bl         kpad_row_read
                   cmp        r0,#0xF
                   movne r0,#0
                   bne        column

columnpop      {r1}
```

```
                cmp     r1,#0x7
                moveq r1,#3
                beq     done

                cmp     r1,#0xB
                moveq r1,#2
                beq     done

                cmp     r1,#0xD
                moveq r1,#1
                beq     done

                cmp     r1,#0xE
                moveq r1,#0

done    pop             {pc}
                ENDP
```