

Solutions to Mid-Term Exam

Question 1

```
-- EECE 379 Midterm Exam
-- Question 1 Solution
-- Ed Casas, October 23, 2000

library ieee ;
use ieee.std_logic_1164.all ;
use ieee.std_logic_arith.all ;

entity hdc is port (
    clk, reset : in std_logic ;
    up, down : out std_logic ;
    track : in unsigned(9 downto 0) ) ;
end hdc ;

architecture rtl of hdc is
    signal reg, next_reg : unsigned(9 downto 0) ;
    signal u, d : std_logic ;
begin

    -- direction outputs

    -- internal
    u <= '1' when reg < track else '0' ;
    d <= '1' when reg > track else '0' ;
    -- external
    up <= u ;
    down <= d ;

    -- track register control

    next_reg <=
        conv_unsigned(0,10) when reset = '1' else
        reg+1 when u = '1' else
        reg-1 when d = '1' else
        reg ;

    -- current-track register

    process(clk)
    begin
        if clk'event and clk='1' then
            reg <= next_reg ;
        end if ;
    end process ;
end rtl ;
```

Question 2

A solution in C would be:

```
main( char *bx, int cx )
{
    while ( cx > 0 ) {
        while ( ( peek(0x30) & 0x01 ) != 0x01 ) {
            /* do nothing */
        }
        poke(0x50,*bx++) ;
        cx-- ;
    }
}
```

The corresponding assembly-language program is:

```
outbuf: cmp     cx,0      ; done if count <= 0
        jle     done
check:  mov     dx,30H   ; get status
        in     al,dx
        and    al,01H   ; check LS bit
        cmp    al,01H
        jne    check   ; repeat until '1'
        mov    al,[bx]  ; get byte from buffer
        mov    dx,50H   ; and output
        out    dx,al
        add    bx,1     ; update pointer
        sub    cx,1     ; and count
        jmp    outbuf  ; loop back
done:   ret
```