Homework 3 - Solutions

1. Data Monitoring

```
void checkspeed()
{ if  (PINB >= 100) PORTD |= 0b00010000;   /* Switch on light (bit 4) */
    else  PORTD &= 0b11101111;             /* Switch off light (bit 4) */
}
```

You could also say: PORTD =0b10000; and PORTD = 0; respectively, but this would set all other bits in PORTD to zero. The solution given above will not change any bits except bit 4.

2. Temperature Control

```
void tempControl()
{ int temperature;
  int *temp_pointer = (int *) 0x400;

  DDRD = 0x11;                          /* bit4 and bit0 output, rest input */
  while (1)
  { temperature = *(temp_pointer);      /* read in the temperature */
    if  (temperature < 20)
    { PORTD |= 0b00000001;              /* turn on heater (bit 0) */
      PORTD &= 0b11101111;              /* turn off aircon (bit 4) */
    }
    else if (temperature > 24)
    { PORTD |= 0b00010000;              /* turn on aircon (bit 4) */
      PORTD &= 0b11111110;              /* turn off heater (bit 0) */
    }
    else PORTD &= 0b11101110;           /* turn off heater and aircon*/
  }  /* end while */
}
```

Q3. Bang Bang Control

```
#include <avr/io.h>
#include <stdio.h>
#include  < peripherals.h>


#define freq 100
#define v_des 5000
Static int enc_old;

int main() {
    //setup the motor pin D0
    DDRD |= 0b00000001;
    //setup the encoder pin B0
    DDRB &= 0b11111110;

    initADC();
    initTimer();


    // read the encoder for the first time
    enc_old = readADC();

    while(1){

    }
    return 1;
}



ISR(TIMER1_COMPA_vect) {

    int enc_new = readADC();

    v_act = (enc_new-enc_old)*freq;

    if(v_act<v_des) {
        PORTD |= 0b00000001;
    }
    else {
        PORTD &= 0b11111110 ;
    }

    enc_old = enc_new;

}
```