EE2016 Microprocessor Lab & Theory

Experiment 4: ARM C-Interfacing - Emulation of Switch LED and Stepper Motor Control

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Brief outline:

Using C-interfacing, use C-programming, to implement the following tasks: (i) Read the status (binary position) of the switch and use the LEDs (8 LEDs are provided) to display the status of each of the 8-bit DIP switch (ii) Stepper motor control using Vi Microsystem's ViARM 7238 development board.

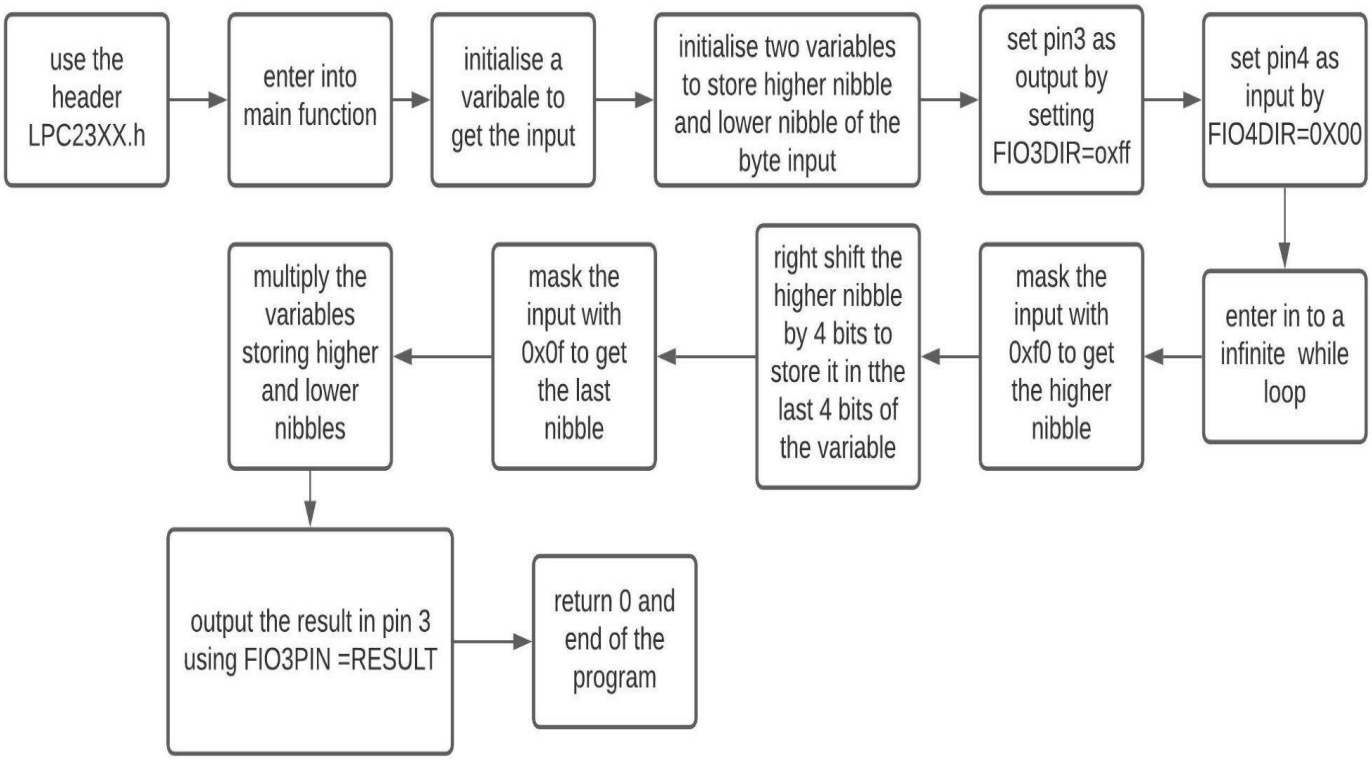
Questions:

1. Write a program (in C) to dis-assemble a byte into two nibbles from the DIP switch states, multiply and display the product in the LED.
2. Modify the demo code (StpprMtrCntrl.c) supplied to demonstrate the control of the stepper motor to rotate in the opposite direction.
3.Given x, give the ARM7 C program to turn a given stepper motor by x degrees (also given a single pulse on the stepper motor moves rotor by k degrees)

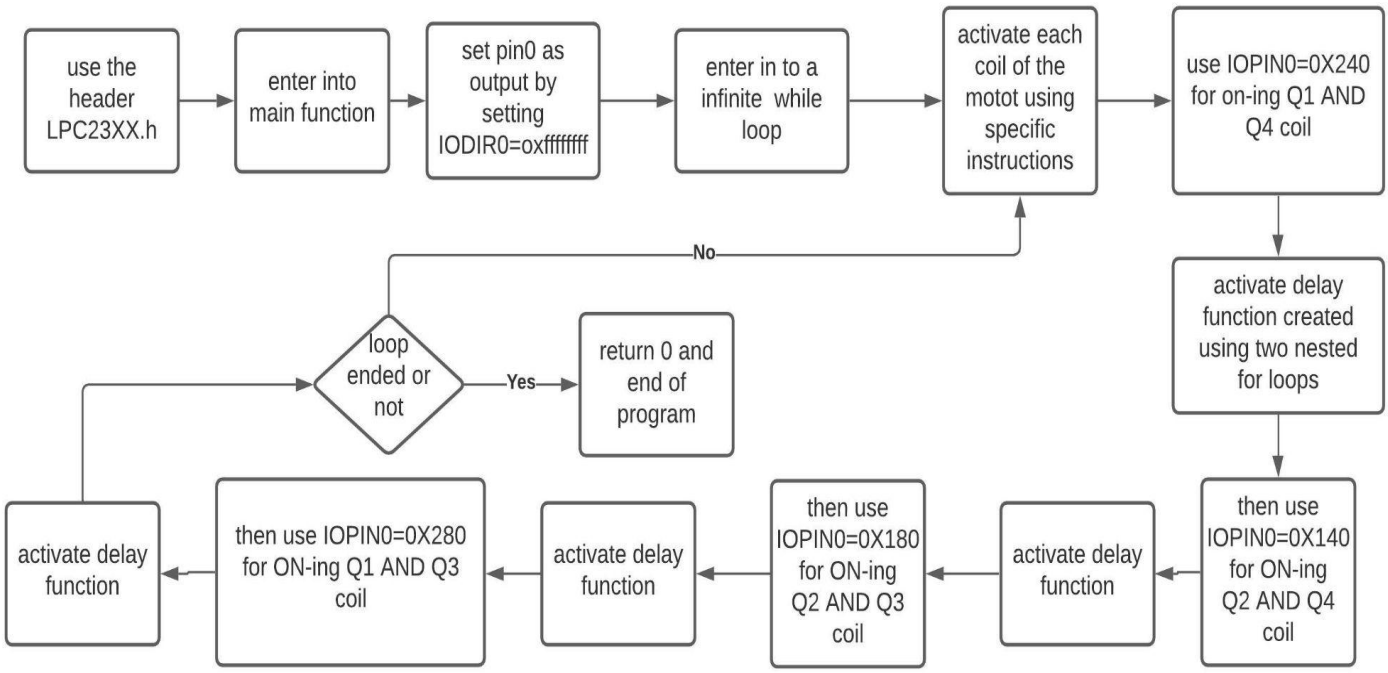
Solution:

a)Flowchart:

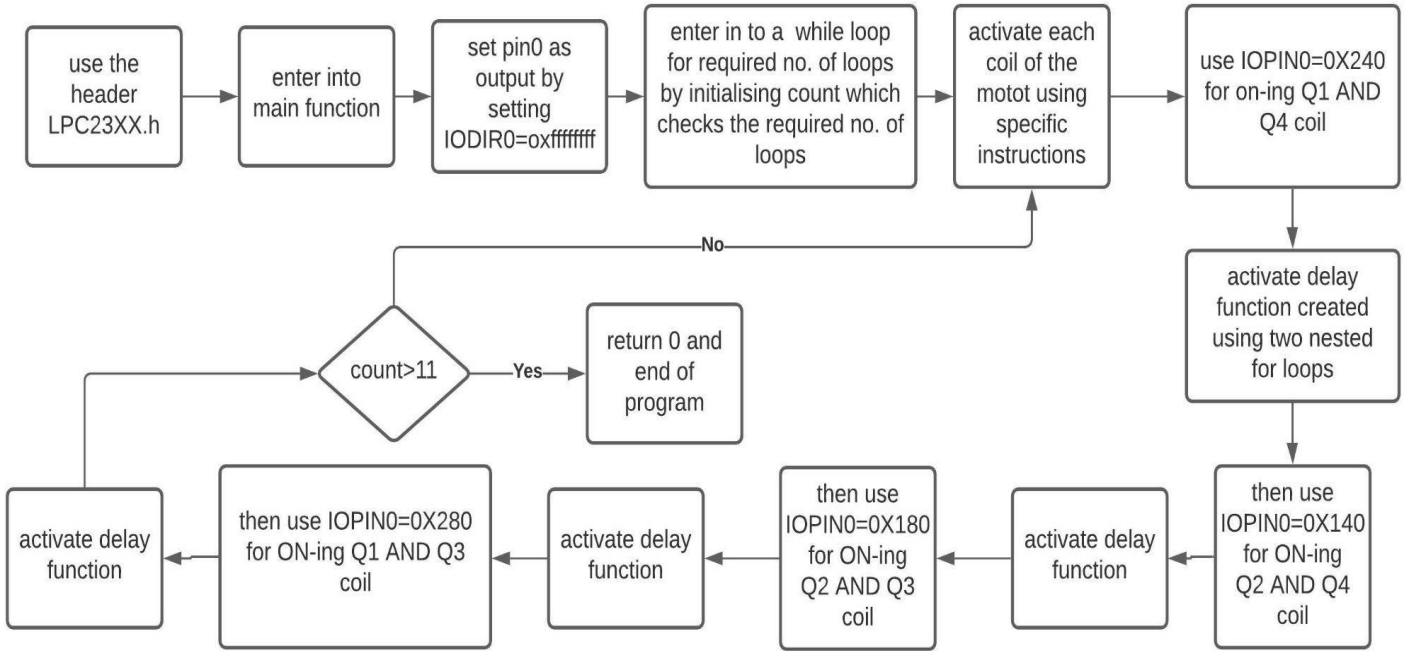
Qno.1:DISASSEMBLING A BYTE:



QNO.2:STEPPER MOTOR ROTATION IN OPPOSITE DIRECTION:



QNO.3: ROTATION OF A GIVEN ANGLE:



Here we are assuming the motor to rotate 88 degrees and the step angle as 2 degrees which is the angle it rotates for each pulse. In the while loop we are giving 4 impulses per loop. and since each pulse will subtent 2 degrees, no. of loops required is 88/(2*4)=11

b)CODES:

QNO.1:DISASSEMBLE A BYTE:

```
#include "LPC23xx.h"

int main()
{
   int a;
   int highByte;
   int lowByte;
   FIO3DIR = 0xFF;
   FIO4DIR = 0x00;

   while(1)
   {
      a = FIO4PIN;
      highByte = a & 0xF0;
      highByte = highByte >> 4;
      lowByte = a & 0x0F;
      FIO3PIN = highByte * lowByte;
   }
   return 0;
}
```

QNO.2:STEPPER MOTOR OPPOSITE ROTATION:

```
#include "LPC23xx.h"

void delay()
{
   int i, j;

   for(i = 0;i < 0xFF; i++)
      for(j = 0;j < 0xFF; j++);
}

int main()
{
   IODIR0 = 0xFFFFFFFF;

   while(1)
```

```
  {
    IOPIN0 = 0x00000240;
    delay();
    IOPIN0 = 0x00000140;
    delay();
    IOPIN0 = 0x00000180;
    delay();
    IOPIN0 = 0x00000280;
    delay();
  }
  return 0;
        }
```

QNO.3: ROTATION OF A GIVEN ANGLE:

```
/*
Here we are assuming the motor to rotate 88 degrees and the step angle as 2 degrees
which is the angle it rotates for each pulse. In the while loop we are giving 4 impulses
per loop. and since each pulse will subtend 2 degrees, no. of loops required is 88/(2*4)=11
*/

#include "LPC23xx.h"

void delay()
{
  int i, j;

  for(i = 0;i < 0xFF; i++)
    for(j = 0;j < 0xFF; j++);
}

int main()
{
  IODIR0 = 0xFFFFFFFF;
        int count = 1;
  while(count<=11)
  {
    IOPIN0 = 0x00000240;
    delay();
    IOPIN0 = 0x00000140;
    delay();
```

```
    IOPIN0 = 0x00000180;
    delay();
    IOPIN0 = 0x00000280;
    delay();
                        count =count +1;
  }
  return 0;
        }
```

Learnings from the experiment:

1)Learnt how to interface stepper motor
2)Learnt how to use C programs to implement LPC2378 ARM processor
3)Learnt how to get the input and project the output using i/o registers