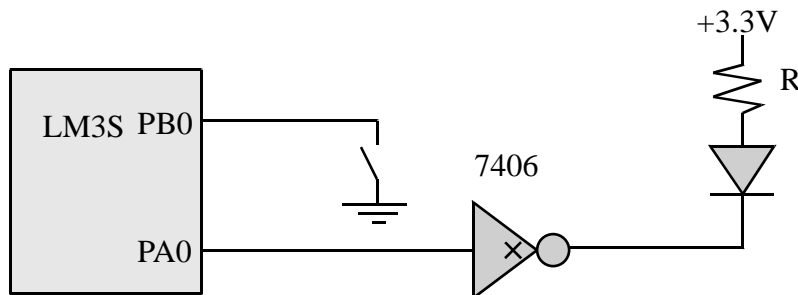


(3) **Question 1.** E) A B and C are all correct

(4) **Question 2.** $5^2 5^1 5^0 = 25, 5, 1$

(3) **Question 3.** Convert both to unsigned. -100 represents 156. 156-50 is 106, which does fit, so **C=1** (correct). R3 is 106, which is $64+42=64+32+10=64+32+8+2 = \mathbf{0x6A}$.
Convert both to signed -100 - 50 = -150, which doesn't fit, so **V=1**.

(20) **Question 4.** Since LED current is more than 8mA, we can't drive it directly from the microcontroller. $R = (3.3-1-0.5V)/20mA = 1.8V/20mA = 90 \Omega$. If we powered the LED from +5V like lab, then $R = (5-1-0.5V)/20mA = 3.5V/20mA = 175 \Omega$. The switch doesn't need a resistor because of the internal pull up.



(10) **Question 5.** Write an assembly subroutine that selects bit 9. The input to the subroutine is a 32-bit number in R0. The output in R0 is 0 if the input bit 9 is 0, and the output is 1 if the input bit 9 is 1.

```
Mask8 AND R0,R0,#0x00000200 ;remove all bits except bit 9
      LSR R0,R0,#9           ;move bit 9 into bit 0 position
      BX LR
```

(10) **Question 6.** Write C function that selects bit 9. The input to the function is an unsigned 32-bit number. The output of the function is 0 if the input bit 9 is 0, and the output is 1 if the input bit 9 is 1.

```
unsigned long Mask8(unsigned long input){ unsigned long output;
  output = input&0x00000200; // select bit 9
  output = output>>9;       // move bit 9 into bit 0 position
  return output;
}
```

(10) **Question 7.** Fill in the boxes with hexadecimal numbers that initializes Port B. Bits 0, 1, and 2 are input. Bits 4 and 6 are output.

```
PortB_Init
  LDR R1, =SYSCTL_RCGC2_R
  LDR R0, [R1]
  ORR R0, R0, #0x02
  STR R0, [R1]
  NOP
  NOP
  LDR R1, =GPIO_PORTB_DIR_R
  LDR R0, [R1]
  ORR R0, R0, #0x50
```

```

BIC R0, R0, #0x07
STR R0, [R1]
LDR R1, =GPIO_PORTB_AFSEL_R
LDR R0, [R1]
BIC R0, R0, #0x57
STR R0, [R1]
LDR R1, =GPIO_PORTB_DEN_R
LDR R0, [R1]
ORR R0, R0, #0x57
STR R0, [R1]
BX LR

```

(30) Question 8. Write an assembly language main program

```

Start   BL   PortB_Init
        LDR   R0,=GPIO_PORTB_DATA_R
Loop    LDR   R1,[R0]      ;read Port B
        ANDS  R1,R1,#0x07 ;mask
        BEQ   Toggle4     ;branch if 000
        CMPS  R1,#0x07
        BEQ   Toggle4     ;branch if 111
Toggle6 LDR   R1,[R0]      ;read Port B
        EOR   R1,R1,#0x40 ;bit 6
        STR   R1,[R0]      ;write to Port B
        B     Loop
Toggle4 LDR   R1,[R0]      ;read Port B
        EOR   R1,R1,#0x10 ;bit 4
        STR   R1,[R0]      ;write to Port B
        B     Loop

```

(10) Question 9. Write a C language main program

```

void main(void){ unsigned long input;
  PortB_Init();
  while(1){
    input = PORTB&0x07;
    if((input==0)|| (input==0x07)){
      PORTB = PORTB^0x10; // toggle bit 4
    } else{
      PORTB = PORTB^0x40; // toggle bit 6
    }
  }
}

```