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

(4) Question 2. \(5^2 \cdot 5^1 \cdot 5^0 = 25, 5, 1\)

(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 \(64+42=64+32+10=64+32+8+2 = 0x6A\). 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.

![LED Circuit Diagram]

(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.

```assembly
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.

```c
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.

```c
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

Loop
LDR R0, =GPIO_PORTB_DATA_R
ANDS R1, R1, #0x07 ; mask
BEQ Toggle4 ; branch if 000
BMPS 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
        }
    }
}