

Last Name (Print): _____

First Name (Print): _____

ID number (Last 4 digits): _____

Section: _____

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

Problem	Weight	Score
1	40	
2	40	
3	20	
Total	100	

INSTRUCTIONS

1. You have 2 hours to complete this exam.
2. This is a closed book exam. You may use one $8.5'' \times 11''$ note sheet.
3. Calculators are allowed.
4. Solve each part of the problem in the space following the question. If you need more space, continue your solution on the reverse side labeling the page with the question number; for example, **Problem 1.2 Continued**. **NO** credit will be given to solutions that do not meet this requirement.
5. **DO NOT REMOVE ANY PAGES FROM THIS EXAM.** Loose papers will not be accepted and a grade of **ZERO** will be assigned.
6. The quality of your analysis and evaluation is as important as your answers. Your reasoning must be precise and clear; your complete English sentences should convey what you are doing. **To receive credit, you must show your work.**

Problem 1: (40 Points)

Figure 1 shows C-code for a microcontroller application that requires digital input and output.

```
/* define FCY before including libpic30.h */
#define FCY 3685000UL

#include <p33EP64MC502.h>
#include <libpic30.h>

int main(void) {
    int i = 0;

    ANSELAbits.ANSA0 = 0;
    ANSELAbits.ANSA4 = 0;
    ANSELBbits.ANSB2 = 0;
    ANSELBbits.ANSB3 = 0;
    ANSELBbits.ANSB8 = 0;

    TRISAbits.TRISA0 = 1;
    TRISAbits.TRISA4 = 0;
    TRISBbits.TRISB2 = 1;
    TRISBbits.TRISB3 = 1;
    TRISBbits.TRISB8 = 0;

    while (i < 5) {
        if (PORTBbits.RB2 == 1) {
            LATAbits.LATA4 = PORTAbits.RA0 & PORTBbits.RB3;
            LATBbits.LATB8 = 0;
        }
        else {
            LATAbits.LATA4 = PORTAbits.RA0;
            LATBbits.LATB8 = !PORTBbits.RB3;
        }
        i = i + 1;
        __delay_ms(1000);
    }
}
```

Figure 1: C-code for digital IO application.

1. (5 points) What is the microcontroller clock frequency in units of MHz?

2. (5 points) Why must the code include the library header file *libpic30.h*?

3. (5 points) Explain the purpose of the following line of code:

```
ANSELbits.ANSA0 = 0;
```

4. (5 points) Explain the purpose of the following lines of code:

```
TRISAbits.TRISA0 = 1;
```

```
TRISAbits.TRISA4 = 0;
```