

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	25	
2	25	
3	25	
4	25	
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: (25 Points)

1. (13 points) Complete the function in Figure 1 to assign the peripherals pins of a dsPIC33EP64MC502 microcontroller as follows:
 - Assign pin 2 and pin 26 for digital input.
 - Assign pin 6 and pin 7 for digital output.

For each line a code, include a short comment describing its purpose.

```
void initialize_DIO_ports(void) {
```

```
}
```

Figure 1: Function for initializing DIO ports.

2. (12 points) Consider the microcontroller code in Figure 2 on page 4 that calls the C function in Figure 1.

(a) (2 points) Determine the value of int_x in the expression

$$int_x = PORTAbits.RA0 + 2*PORTBbits.RB15;$$

if pin 2 is connected to V_{SS} and pin 26 is connected to V_{DD} .

(b) (4 points) If the value of int_x is three, approximate the time, in units of seconds, it will take for the inner while loop to complete execution each time it is called.

(c) (6 points) If the voltage at the inputs pins 2 and 26 are fixed so that int_x is two, what is the approximate period and duty cycle of the square-wave signal generated at pin 6?