ECE/CS 5780/6780: Embedded System Design

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Midterm 1 Solution

Grading Information

- Exam grades will be final on 02/27/2008.
- Please discuss any questions about the grading of a question with the person who graded that question.
  - Question 1: Anthony
  - Question 2: Steve
  - Question 3: Scott

Statistics

- Class average is 73.6.

Approximate grade breakdown

- This will give you an idea of how you scored although 5780 and 6780 are graded on different curves.
- 91-100 A
- 82-90 A-
- 74-81 B+
- 73-66 B
- 65-58 B-
- 57-50 C+
- 49-40 C
- 39-0 C-
Question 1a

- 4 points.
- Points were awarded for each guideline and justification.
- Guidelines mentioned in lecture (4 & 5) were given full credit.
- Other reasonable guidelines were also given full credit.

Question 1b

- 6 points.
- Two of the following needed for full points:
  - Load the accumulator from different memory locations.
  - Differ in object code length.
  - Both load accumulator from a memory address.
  - Addressing mode differences.

Question 2a

- 20 points.

Question 2b

- 20 points.

```c
#define IDLE 0
#define BUZZ 1
#define SNOOZE 2
#define SOUNダLARM 1
#define ALARMDFF 2
#define SNOOZEIN 4
while(1) {
    int state = IDLE;
    unsigned char input;
    switch(state) {
        case IDLE:
            putOutput(0x00);
            waitMin();
            input = getInput();
            if(input == SOUNダLARM) {
                state = BUZZ;
            }
            break;
    }
```
Question 2b (con’t)

```c
case BUZZ:
    putOutput(0x01);
    input = getInput();
    if(input & ALARMOFF) {
        state = IDLE;
    }
    if(input & SNOOZEIN) {
        state = SNOOZE;
    }
    break;

case SNOOZE:
    putOutput(0x00);
    waitMin(5);
    input = getInput();
    if(input == ALARMOFF) {
        state = IDLE;
    } else {
        state = SNOOZE;
    }
    break;
```

Question 3a

- 6 points.

**Table:**

<table>
<thead>
<tr>
<th>PTT0</th>
<th>Row 0</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTT1</td>
<td>Row 1</td>
<td>Output</td>
</tr>
<tr>
<td>PTT2</td>
<td>Row 2</td>
<td>Input</td>
</tr>
<tr>
<td>PTT3</td>
<td>Row 3</td>
<td>Input</td>
</tr>
</tbody>
</table>

**Diagram:**

```
PTT0  ─────── Row0
   │  ┌──────┘
   │  └──────┐
PTT1  ─────── Row1
PTT2  ─────── Col0
PTT3  ─────── Col1
```

Question 3b

- 4 points.

DDRT = 0x03;

Question 3c

- 20 points.

```c
void Keypad_WaitPress() {
    unsigned char keyValue;
    do {
        keyValue = getKey();
    } while(keyValue == 55);
    Timer_Wait1ms(10);
}

void Keypad_WaitRelease() {
    unsigned char keyValue;
    do {
        keyValue = getKey();
    } while(keyValue != 255);
    Timer_Wait1ms(10);
}
```
unsigned char getKey() {
    unsigned char row, rawKey, keyValue = 255;
    for(row = 0; row < 4; row++) {
        PTT = row;
        rawKey = (PTT & 0x0C) >> 2;
        if(rawKey < 3) {
            break;
        }
    }
    if(row < 3) {
        keyValue = (rawKey + 1) + (row * 3);
    } else {
        if(rawKey == 1) {
            keyValue = 10;
        } else if(rawKey == 2) {
            keyValue = 0;
        } else if(rawKey == 3) {
            keyValue = 11;
        }
    }
    return keyValue;
}