ECE/CS 5780/6780: Embedded System Design

Scott R. Little

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
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.

![State Diagram]

```c
#define IDLE 0
#define BUZZ 1
#define SNOOZE 2
#define SOUNDALARM 1
#define ALARMOFF 2
#define SNOOZEIN 4

while(1) {
    int state = IDLE;
    unsigned char input;
    switch(state) {
    case IDLE:
        putOutput(0x00);
        waitMin(1);
        input = getInput();
        if(input == SOUNDALARM) {
            state = BUZZ;
        }
        break;
    ```
Question 2b (con’t)

```java
  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>
<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>
**Question 3b**

- 4 points.

\[ \text{DDRT} = 0x03; \]

**Question 3c**

- 20 points.

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

void Keypad_WaitReleasepr {
    unsigned char keyValue;
    do {
        keyValue = getKeypr;
    } while(keyValue != 255);
    Timer_Wait1ms(10);
}
```
Question 3d

- 20 points.

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;
        }
    }
    return keyValue;
}

Question 3d (con't)

    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;