Otto-von-Guericke Universität Magdeburg
Arbeitsgruppe für Eingebettete Systeme und Betriebssysteme
Prof. Dr. Jörg Kaiser

# Theoretisches Aufgabenblatt 10

Abgabetermin: 26.01.-28.01.2015

1. Describe a way to determine if a single bit is set or unset within the A register of the M6809 CPU.? What needs to be done to set a single bit of this register to 1 respective 0? Translate your solution to an assembler program testing the $n$th bit of the A register. The number $n$ is stored in memory address $1000

2. Given the following simple program in MC6809 assembly:

```
1          org     $1000
2  START   lda     #$08
3          sta     $6000
4          lsra
5          lsra
6          lsra
7  LOOP    inca
8          jmp     LOOP
9          end
```

Quelltext 1: zu untersuchender Assemblercode

   How does the value of register $A$ change over time? Modify the code that the program terminates when the initial state $A = 8$ is reached again.
   The first line (`org $1000`) simply states the memory address, where the program shall be loaded and can be ignored for this task.

3. To compute the term $d = 2 \cdot b - 10_{dec}$ two programmers present you with the following 6809 assembly programs.

   Check if the programs work correctly and correct possible mistakes. Grade the implementations considering execution cycles and memory consumption.

```
LDA   #$2
MULD
SUBD  #$A
```

```
LDA   #$0  // Sicherstellen dass in A eine 0 steht
ASLB       // Linksshift von b
ADCA  #$0
SUBD  10
```

   The following table contains the assembly mnemonics together with their respective execution cycle count and the amount of memory bytes they need.

| **Assembly Mnemonic** | **Memory bytes** | **Cycle count** |
|---|---|---|
| LDA | 2 | 2 |
| ASLB | 1 | 2 |
| SUBD | 3 | 4 |
| MUL | 1 | 11 |
| ADCA | 2 | 2 |

4. Answer the following questions regarding RISC/CISC.
   - What are the differences between RISC and CISC computers?
   - What was the intention towards the RISC computers?
   - Describe respective benefits and drawbacks of both approaches?
   - Why need RISC computers more registers then CISC computers?
5. Explain the baseline principle of pipelining. Which architectural principle (RISC/-CISC) is better suited to implement pipelining and why?