ECED3403 – Lab 4

Grace Yu

B00902046

July 5th, 2024

1. Design

1.1. Problem Introduction

This lab aims to further develop the XM23p emulator. Lab 4 will implement the SETCC and CLRCC commands. SETCC will set specified flags, while CLRCC will clear specified flags. Additionally, debugging tools that display stages of the pipeline happening at every clock tick will be included. These two commands will allow for better debugging functionality, and the two new commands can be used in a variety of code applications.

1.2. Design Section

PSEUDOCODE:

```
A small amount of code used or referenced in the pseudocode was documented in
previous assignments or labs.

PIPELINE FUNCTION:
WHILE pc is not breakpoint AND instructionbit is not equal to 0
      IF clock/2 remainder is equal to 0
            IF DMAR is RD
                  CALL execute1
            CALL fetch0
            CALL decode0
      ELSE
            CALL fetch1
            CALL execute0
      END IF
      IF increment mode is on AND clock/2 remainder is not equal to 0
            return
      END IF
      INCREMENT CLOCK
END FUNCTION

DECODE FUNCTION
      DEBUG
            PRINT F0 and D0 stages
      END DEBUG
      IF instruction is SETCC or CLRCC
```

```
            SAVE opcode
            SAVE v, slp, n, z, c
      . . . other code from previous assignments and labs
      END IF
END FUNCTION

F1 FUNCTION
      DEBUG
            PRINT F1 and E0 stages
      END DEBUG
      . . . other code from previous assignments and labs
END FUNCTION

EXECUTE1 FUNCTION
      SWITCH(opcode)
            . . . other code from previous assignments and labs
            CASE SETCC
                  CALL setcc_execute
                  BREAK
            CASE CLRCC
                  CALL clrcc_execute
                  BREAK
      END SWITCH
END FUNCTION

setcc_execute FUNCTION
      psw v |= operand v
      psw slp |= operand slp
      psw n |= operand n
      psw z |= operand z
      psw c |= operand c
 END FUNCTION

 clrcc_execute FUNCTION
      psw v &= ~operand v
      psw slp &= ~operand slp
      psw n &= ~operand n
      psw z &= ~operand z
      psw c &= ~operand c
END FUNCTION

execute1 FUNCTION
      SWITCH(opcode)
            CASE LD
                  CALL ld_execute1
                  BREAK
            CASE ST
                  CALL st_execute1
                  BREAK
            CASE LDR
                  CALL ldr_execute1
                  BREAK
            CASE STR
                  CALL str_execute1
                  BREAK
      END SWITCH
      DCTRL = DONE
END FUNCTION
```

1.3. Data Dictionary

```
operand = v + slp + n + z + c
v = [SET | CLEAR]
slp = [SET | CLEAR]
n = [SET | CLEAR]
z = [SET | CLEAR]
c = [SET | CLEAR]
SET = 1
CLEAR = 1
```