ECED3403 – Lab 3

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1. Design

1.1. Problem Introduction

This lab aims to develop additional menu commands for the XM23p pipeline. These commands will act as debugger tools. They will allow for changing and display the contents of the register file, changing the contents at a specified data or instruction memory location, and setting a breakpoint at which the code stops execution.

1.2. Design Section

PSEUDOCODE:

```
MAIN:
ADDED menu options in switch:
CASE ‘c’ or ‘C’
    CALL mem_change
    BREAK
CASE ‘b’ or ‘B’
    CALL breakpoint_set
    BREAK
CASE ‘r’ or ‘R’
    CALL reg_display
    BREAK
CASE ‘s’ or ‘S’
    CALL reg_set
    BREAK
END SWITCH
END MAIN
```

```
FUNCTION mem_change
    PRINT “Change instruction or data memory?”
    SCAN user input into MEMTYPE
    PRINT “Enter address and contents”
    SCAN user input into ADDRESS and CONTENTS
    address <- address / 2
    IF CONTENT OR ADDRESS is not between 0x0000 and 0xffff
       RETURN
    END IF
    SWITCH MEMTYPE
    CASE ‘I’ or ‘i’
       imem.word_mem[ADDRESS] <- CONTENTS
       BREAK
    CASE “D’ or ‘d’
       dmem.word_mem[ADDRESS] <- CONTENTS
       BREAK
    END SWITCH
    END FUNCTION

FUNCTION breakpoint_set
    PRINT “Current breakpoint”
    PRINT “Set new breakpoint”
    SCAN user input into BREAKPOINT
    RETURN
    END FUNCTION

FUNCTION reg_display
    FOR i from 0 to 7
       PRINT register i and its corresponding value
    END FOR
```

```
END FUNCTION


FUNCTION reg_set
    PRINT “Enter reg no and new value”
    SCAN user input into REGNO and VALUE
    srcconarray[REGISTER][REGNO] <- VALUE
END FUNCTION
```

1.3. Data Dictionary

```
memtype = [‘i’ | ‘I’ | ‘d’ | ‘D’] * imem or dmem *

address = [0x0000 – 0xFFFF] * valid memory addresses *

contents = [0x0000 – 0xFFFF] * valid content values *

breakpoint = [0x0000 – 0xFFFF] * valid content values *

regno = [0 – 7] * valid register numbers *

value = [0x0000 – 0xFFFF] * valid register content values *

regprintarray = [“R0: “ | “R1: “ | “R2: “ | “R3: “ | “R4 (BP): “ | “R5 (LR):
“ | “R6 (SP): “ | “R7 (PC): “] * array of register names *

srcconarray = [register | constant]
register = [0x0000 – 0xFFFF] *valid register values
constant = [0 | 1 | 2 | 4 | 8 | 16 | 32 | -1] * valid constant values *
```