Lab 4
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Do the following operations and record their micro instructions:

1. load the number 8 into memory location 5
    a. Set EXTin to 00000101, EXTout, MARin
    b. Set EXTin to 00001000, EXTout, MEMin, MARout, MEMen
2. move (the contents in) memory location 5 to the PC
    a. MARout, MEM out, MEM en, PCin
3. increment the PC
    a. PC + 1 in, PC + 1 out, PC in

Write out the equivalent assembly language mnemonics of the following machine language code: (B=0, C=1)

Location	Contents	Assembly Language Mnemonics
0	10000001	NOT B, C
1	00010110	XOR #0, 0
2	00000101	XOR B, (C)
3	00001000	XOR C,B

Load the above program (in machine code) to the memory.

Pre-load value 1 in the B register, preload 0 in the memory location 8.

Write out the microinstructions necessary to execute the program.

Location	Steps needed for instruction at location
PRE LOAD	1. EXT in set to 1, B in, EXT out 2. EXTin to 1000, EXT out, MAR in 3. MAR out, EXTin to 0, EXT out, MEM in, MEM en 4. MEM out, MEM en, PC in
0	NOT B, C 1. PC out, MARin 2. MAR out, MEM out, MEM en, IR in 3. Bout, ACCin 4. ALU en, ALU out, C in 5. PC + 1 in, PC + 1 out, PC in
1	XOR #0, 0 1. PC out, MARin 2. MAR out, MEM out, MEM en, IR in 3. EXT in to 0, EXT out, ACCin 4. EXT in to 0, EXT out, MARin 5. MAR out, MEM out, MEM en, TMPin 6. ALU en, ALU out, MARin, MEMin, MEMen 7. PC + 1 in, PC + 1 out, PC in
2	XOR B, (C) 1. PC out, MARin 2. MAR out, MEM out, MEM en, IR in 3. Bout, ACCin 4. Cout, MARin 5. MAR out, MEM out, MEM en, TMP in 6. ALU en, ALU out, MAR out, MEM in, MEM en 7. PC + 1 in, PC + 1 out, PC in
3	XOR C,B 1. PC out, MARin 2. MAR out, MEM out, MEM en, IR in 3. Cout, ACCin 4. Bout, TMPin 5. ALU en, ALU out, B in 6. PC + 1 in, PC + 1 out, PC in

Implement the following tasks with your 8-bit CPU circuit, remember to pre-load the registers or memory when needed

1. Write out and hand in the microinstructions to perform XOR #5,(C)
    a. LOAD 101 into EXTin
    b. EXT out, TMPin
    c. Cout, MARin
    d. MAR out, MEM out, MEM en, ACC in
    e. ALU en, ALU out, MAR out, MEM in, MEM en

    00010101
    00000101

2. Write out and hand in the microinstructions to perform OR 5, 8
    a. LOAD 00000101 into EXTin
    b. EXT out, MARin
    c. MAR out, MEM out, MEM en, ACC in
    d. LOAD 0000100 into EXTin
    e. EXT out, MARin
    f. MAR out, MEM out, MEM en, TMP in
    g. ALU en, ALU out, MAR out, MEM in, MEM en
    h. MAR out, MEM in, MEMen

    11110110
    00000101
    00001000