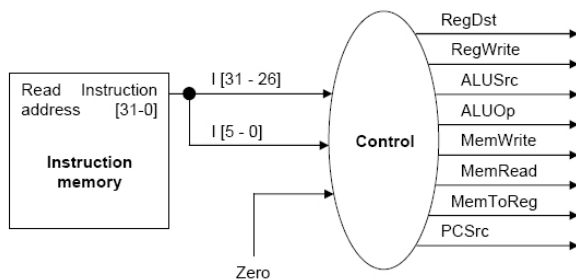
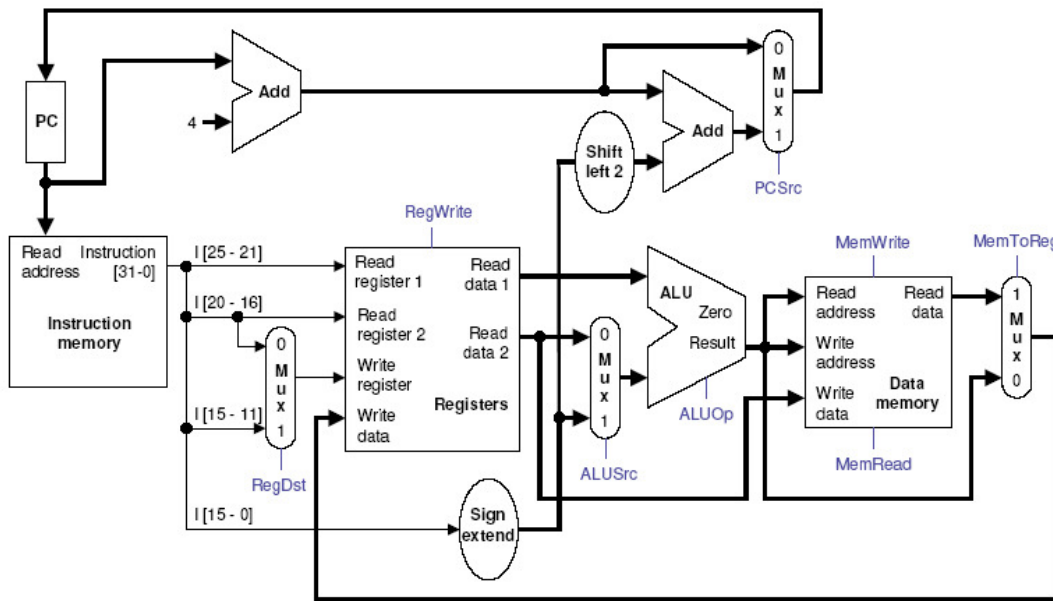


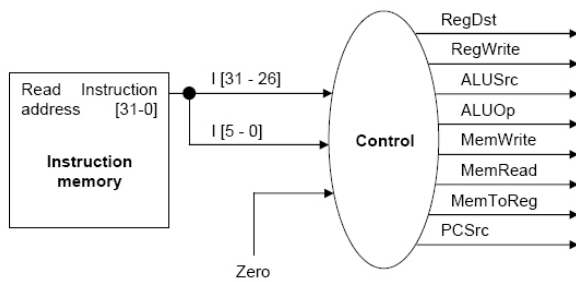
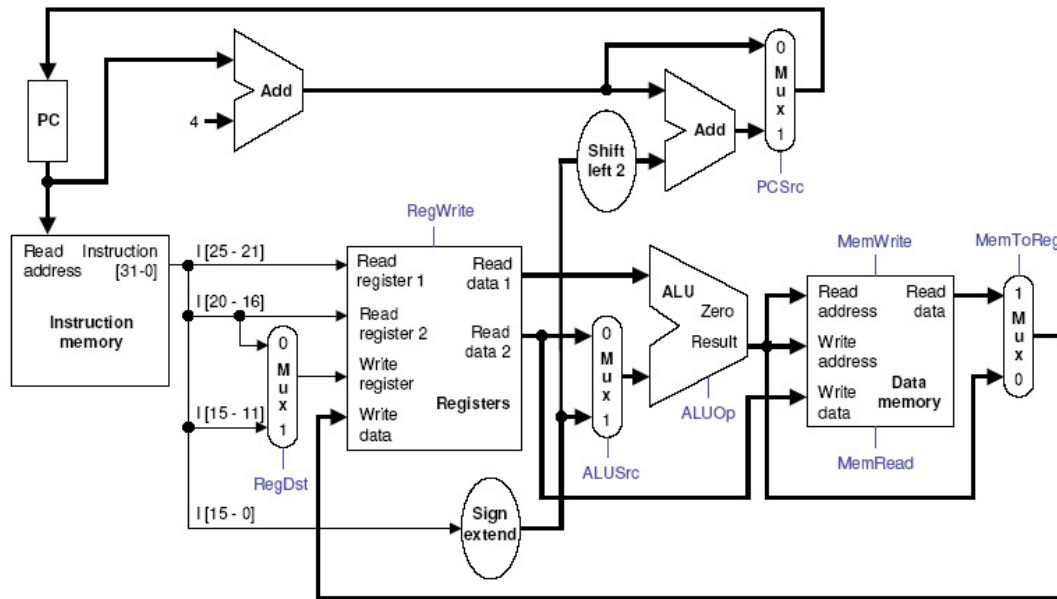
CEN 305 Hw 3

Question. (60 points, 30 points each) Add the new instructions to the single cycle MIPS processor. Show the necessary additions and modifications (if any addition or modification is needed) to the both datapath and control unit on the figure given for each subquestion. Show the binary representation of the new instructions. Then explain how your modified processor can process the new instruction.

- a) Add the **xor \$rd,\$rs,\$rt** instruction to the processor. This instruction is same with the ordinary xor instruction.



b) Add the **addi \$rt,\$rs,immediate** instruction to the processor. This instruction is same with the ordinary addi instruction.



Question 2. (40 points, 20 points each) A MIPS code and the time consumptions of the hardware units are given. Please answer the questions regarding this code and the time consumptions.

```
add $2,$3,$2
add $4,$3,$2
sub $5,$5,$7
or $5,$0,$7
lw $6,$4,5($4)
sw $1,$1,5($4)
lw $6,$3,5($4)
sw $2,$1,5($3)
```

Time consumptions:

Reading the Instruction memory: 5ns

Reading register file: 2ns

ALU computation: 4ns

Accessing(Reading and Writing) Data Memory: 5ns (Use this value for multicycle processor)

Writing to the register file: 3ns

- a) How many cycles needed for this code to be executed on single cycle MIPS processor? And how much time is needed?
- b) How many cycles are needed to execute the code in multicycle processor and how much time is needed? (Assume the control unit works with no problem)

Deadline: 15. December. 2011, 23.59

Submission: Please submit your homework to the Online Course System. Other submissions will **NOT** be graded. Please contact Esra Ruzgar for further questions.

Homework Policies:

1. Cheating is strongly discouraged.
2. Late homeworks will be graded as 0.
3. Please comment your source codes.

Asist. Prof. Dr. Orhan Dagdeviren
Department of Computer Engineering
Izmir University