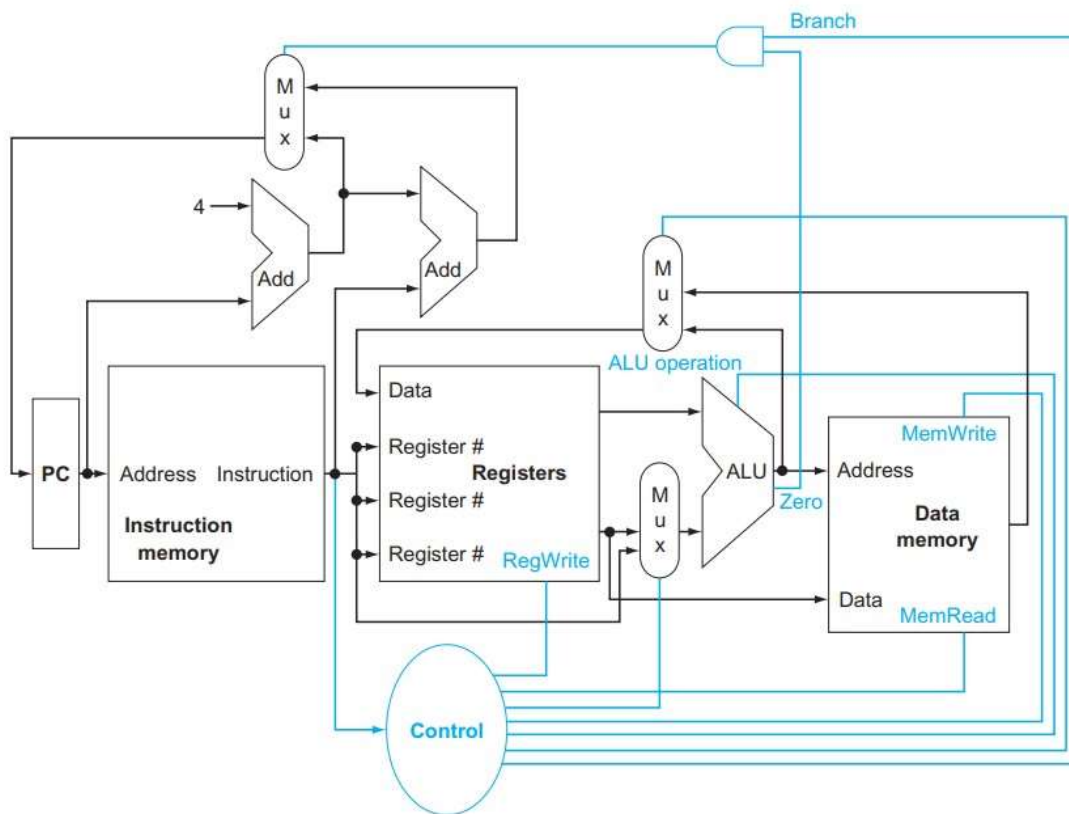# Assignment-3

There are 5 Questions. Each Question Carry 05 Mark.

Assume that there are no pipeline stalls and that the breakdown of executed instructions is as follows: add:20%, addi:20%, not:0%, beq:25%, lw:25%, sw:10%.

You can consult the image for reference.

Question 1:

In what fraction of all cycles is the data memory used? Show the calculation

Question 2:

In what fraction of all cycles is the input of the sign-extender circuit needed? Show the calculation.

Now consider the code sequence below:

```
Lw $t0,36($t1)
Lw $t2,40($t0)
Lw $t3,44($t2)
Sll $t3,$t2,2
Sub $t0,$t3,$t2
Addi $t0,$t0,2
Srl $t0,$t3,2
```

For the next questions, you will need to draw appropriate datapath showing the pipeline stages and hazard removal methods. *Consult lecture 11 for relevant information.*

Question 3:

If you only use Stall to overcome the data hazard how many clock cycles you would need for executing above code sequence? Draw the datapath as well as calculate the CPI.

Question 4:

If you only use Stall and Forwarding to overcome the data hazard how many clock cycles you would need for executing above code sequence? Draw the datapath as well as calculate the CPI.

Question 5:

If you only use Stall, Forwarding and load ordering/code scheduling to overcome the data hazard how many clock cycles you would need for executing above code sequence? Draw the datapath as well as calculate the CPI.