# Digital Design and Computer Architecture (E85)

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**Problem Set 8**

1) How would you implement an $R_{rshift}$-Type data processing instruction as a pseudo instruction? Which instructions would be executed for the following instruction:

```
ADD R0, R1, [R2 LSL R3]
```

2) Your friend is an incredibly skill circuit designer. She has offered to redesign one of the units in the single-cycle ARM processor to have half the delay. Using the delays from Table 0.5 from chapter 7, which unit should she work on to obtain the greatest speedup of the overall processor? What would the cycle time of the improved machine be?

3) Suppose one of the following control signals in the single-cycle ARM processor has a stuck-at-0 fault, meaning that the signal is always 0, regardless of the intended value. What instructions would malfunction? Why?

   a. MemtoReg

   b. PCSrc

   c. ALUControl

## 4) Time

Please indicate how many hours you spent on this problem set. This will not affect your grade (unless completely omitted), but will be helpful for calibrating the workload for next semester's class.