Computer Architecture and Programming Languages
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Homework 11 - Pipelining and Regular Expressions

Problem 11.1

Solution:

For the single-cycle approach, we have 7 instructions and the slowest time is 800 ps, which equals to t = 5600 ps.

For multi-cycle approach, we have the following:
2 lw instructions: $800 \times 2 = 1600$ps
1 sw instruction: 700ps
3 R-format instructions: $600 \times 3 = 1800$ps
1 branch instruction: 500ps

In total, we have t = 4600 ps

For the pipelined approach, we have the sum of the lw instruction, sw instruction, R-format and branch, which equals to t = 2600ps.

Therefore, these are the ratio for each parts:

a. multi-cycle approach compared to single cycle approach
   4600 /5600 = 0.82

b. pipelined approach compared to single cycle approach
   2600 /5600 = 0.46

c. pipelined approach comapred to multi cycle appraoch
   2600 /4600 = 0.57

Problem 11.2

Solution:
\d in this question refers to the numbers from 0 to 9

a. ”\$zero”

b. ^a.∗b$

c. ^\d.∗\d$

d. ^abba(4,7)b∗?$

e. ^\d+$

f. ^-?\d+$

g. ^\d+.\d+$

h. p.t

Problem 11.3

Solution:

a. 1 and 3

b. 1, 2, 3, 4, 6

c. 3, 4, 5

d. 1, 3, 5