CPRE 381 HW1 Ningyuan Zhang

1. execution ~~tiom~~ time $= IC * CPI * CP$

$IC = 100 \times 1000 = 100,000$

$f_{ALU} = \frac{IC_{ALU}}{IC} = \frac{100000 \times 30\%}{1000000} = 30\%$, $f_{4S} = 35\%$, $f_{control} = 35\%$

~~IC~~ $CPI = f_{ALU} * CPI_{ALU} + f_{4S} * CPI_{4S} + f_{control} * CPI_{control}$

$= 30\% * 1.1 + 35\% * 1.3 + 35\% * 1.5 = 1.31$

$CP = 1GHz$

so : ex. time $= 1000000 \times 1.31 \times 1GHz = 1000000 \times 1.31 \times \frac{1}{10243} = \boxed{0.001225}$

2. $IC_{new\ control} = 1000000 \times 35\% - (1000000 \times 35\%) \times 15\% = 227500$

$IC_{ALU\ new} = 0$

$IC_{new\ 4S} = 1000000 \times 35\% + 52500 + 1000000 \times 35\% \times 20\% = 472500$

$\underline{IC_{new} = IC_{new\ control} + IC_{new\ ALU} + IC_{new\ 4S} = 227500 + 0 + 472500 = 760000}$

above is wrong, below is correct:

$100 \times 35\% = 35$, $35 - 35 \cdot 15\% = 29.75 = IC_{new\ control}$ (one loop)

$100 \times 35\% + 35 \cdot 15\% = 40.25 = IC_{new\ 4S}$ (one loop)

$20\% \times (40.25 - 35) = 1.05 = IC_{new\ ALU}$ (one loop)

$IC = (29.75 + 1.05 + 40.25) \cdot 1000 = 71050$

$CPI = \frac{29.75}{71.05} \cdot 1.5 + \frac{1.05}{71.05} \cdot 1.1 + \frac{40.25}{71.05} \cdot 1.3 = 1.38$

ex. time new $= 71050 \cdot 1.38 \cdot \frac{1}{10243} = \boxed{0.00091\ S}$

3. $f_e = \frac{T'}{T_{old}} = \frac{350000 \cdot 1.5 \cdot CP}{1000000 \cdot 1.31 \cdot CP} = 35\% \cdot \frac{1.5}{1.31} = \boxed{0.4}$

$SU_e = \boxed{1.05}$

$SU_{overall} = \frac{1}{(1 - 0.4) + \frac{0.4}{1.05}} = \boxed{1.01942}$