2018/662 이건형

1.

Class	A	B	C	D
CPI	1×10^{5}	2×10^{5}	5×10^{5}	2×10^{5}
P1	1	2	3	3
P2	2	2	2	2

b. P1. Clock cycles $= 1\times10^{5} + 2\times10^{5}\times2 + 5\times10^{5}\times3 + 2\times10^{5}\times3$

$= 26\times10^{5}$

P_2. Clock cycles $= 1\times10^{5}\times2 + 2\times10^{5}\times2 + 5\times10^{5}\times2 + 2\times10^{5}\times2$

$= 20\times10^{5}$

c. P1 CPU Time = Clock Cycles / Clock Rate = IC × CPI / Clock Rate.

$= 26\times10^{5} / 2.5\times10^{9} = 10.4\times10^{-4}$ s

P2 CPU Time $= 20\times10^{5} / 3\times10^{9} = 6.666\times10^{-4}$ s.

P1 CPI $= 10.4\times10^{-4}\times2.5\times10^{9}/10^{6} = 2.6$.

P2 CPI $= 6.666\times10^{-4}\times3\times10^{9}/10^{6} = 2.0$.

$$\frac{\text{P1 CPU time}}{\text{P2 CPU time}} = \frac{10.4}{6.666} = 1.56$$

∴ P_2 is 1.56 times faster than P_1.

2. a. $CPI = \frac{CPU\ Time}{Clock\ Cycle\ time \times IC}$ b. Clock cycle time = $\frac{CPU\ time}{CPI \times IC}$

CCT

$CPI_A = 1.1$

$CPI_B = 1.25$.

$$\frac{CCT_A}{CCT_B} = \frac{\frac{CPU\ time}{1.1 \times 1.0 \times 10^9}}{\frac{CPU\ time}{1.25 \times 1.2 \times 10^9}} = 1.364$$

Compiler B is 1.364 times faster than Compiler A

C. CPU time = CPI × Clock Cycle time × Ic.

T

$$\frac{T_A}{T_{new}} = \frac{1.1 \times CCT \times 1.0 \times 10^9}{1.1 \times CCT \times 6.0 \times 10^8} = 1.667$$, new compiler is 1.667 times faster than A.

$$\frac{T_B}{T_{new}} = \frac{1.25 \times CCT \times 1.2 \times 10^9}{1.1 \times CCT \times 6.0 \times 10^8} = 2.272$$, new Compiler is 2.272 times faster than B.

3. a. $CPI = \frac{CPU\ Time}{Clock\ cycle\ time \times IC} = \frac{750.}{0.333 \times 10^{-9} \times 2.389 \times 10^{12}} = 0.943$.

b. SPEC ratio = $\frac{9650}{750} = 12.867$.

c. 10% ↑. $CPI = \frac{CPU\ time \times (1X)}{CCT \times IC \times 1.1}$ → $x = 1.1$. 10% increase.

d. CPU time = $CPI \times CCT \times IC$, → $1.1 \times 1.05 = 1.155$, 15.5% increase

↑5%. ↑10%.

e. $CPU\ time_{(new)} = 750 \times 1.155 = 866.25$ s.

SPEC ratio = $\frac{9650}{866.25} = 11.14$.

f. $CPI_{new} = \frac{700 \times 4 \times 10^9}{2.389 \times 10^{12} \times 0.85} = 1.379$

4.a. $T_{improved} = \frac{T_{affected}}{improv\ factor} + T_{unaffected}$

$\Rightarrow T_{FP} = 705 \times 0.8 = 565.$

$T_{improved} = 250 - 14 = 236s$, 5.6% reduced

b. Since the ~~total~~ time is reduced by 20%,
the time for INT operations reduced by 20%. which is 445. (from 565)

C. $T_{FP} + T_{LIS} + T_{INT} = 70 + 85 + 55 = 210 > 200 = T_{target}.$

$\therefore$ impossible (T_{branch} should be -10s..)