Answer to Qution-1

(1)

	A	B	C	D
CPI_{PS}	7	2	3	6
CPI_{XB}	5	4	2	1

clock rate PS = 2.7 GHz = 2.7×10^9 Hz

" " XB = 3 GHz = 3×10^9 Hz

Instruction Count = 1×10^6

IC

30% of A $\rightarrow$ $1 \times 10^6 \times 0.3 = 3 \times 10^5$

50% of B $\rightarrow$ $1 \times 10^6 \times 0.5 = 5 \times 10^5$

10% of C $\rightarrow$ $1 \times 10^6 \times .1 = 1 \times 10^5$

10% of D $\rightarrow$ $1 \times 10^6 \times 0.1 = 1 \times 10^5$

for PS,

Clock Cycle = $(7 \times 3 \times 10^5 + 2 \times 5 \times 10^5 + 3 \times 1 \times 10^5 + 6 \times 1 \times 10^5$

$= 4 \times 10^6$

$\therefore$ Avg. CPI = $4 \times 10^6 / 1 \times 10^6$

$= 4$

for XB, Clock Cycles = $(5 \times 3 \times 10^5 + 4 \times 5 \times 10^5 + 2 \times 1 \times 10^5 + 1 \times 1 \times 10^5)$

$= 3.80 \times 10^6$

$\therefore$ Avg. CPI = $3.80 \times 10^6 / 1 \times 10^6$

$= 3.8$

$\therefore$ Difference = $(4 - 3.8)$

$= 2$ (Ans:)

(2) Excution T_{PS} = IC × CPI / Rate

$= 10^6 \times 4 / 2.7 \times 10^9$

$= 0.00148$ s

Execution T_{XB} = IC × CPI / Rate

$= 10^6 \times 3.8 / 3 \times 10^9$

$= 0.00126$ s

$\therefore$ Difference = $(0.00148 - 0.00126) = 0.22$ (Ans:)

③ Spec. Ratio = Reference Time / Calculated Time

$= 120 / IC \times CPI \times \text{Clock Cycle Time}$

$= 120 / 10^6 \times 4 \times 1/2.7 \times 10^9$

$= 81$ (Ans:)

Answer to Question - 2

①

Given,

Intial Execution time = 540s

$IC = 1.35 \times 10^{12}$

Clock Cycle Time = 0.22×10^{-9} s

Reference Time = 1394s

We know,

Execution time = IC × CPI × Clock Cycle Time

$CPI = \text{Execution time} / IC \times \text{Clock cycle time}$

$= 540 / (1.35 \times 10^{12}) \times (0.22 \times 10^{-9})$

$CPI = 540 / 297$

$\therefore CPI = 1.818$ (Ans:)

(11)

IC increased by 12%. , $I_{new} = 1.12 \times 1.35 \times 10^{12}$

$= 1.512 \times 10^{52}$

CPI increased by 6%. $CPI_{new} = 1.06 \times 1.818$

$= 1.927$

$\therefore T_{new} = IC_{new} \times CPI_{new} \times \text{Clock Cycle Time}$

$= (1.512 \times 10^{12}) \times 1.927 \times 0.22 \times 10^{-9}$

$= 641.1 \text{ sec}$

$\therefore$ SPEC ratio = Reference Time / Execution Time

$= 1394 / 641.1$

$= 2.174$ (Ans:)

Answer to Question-3

(i)

$T_{original} = 2100$ sec

affected part = 90%

$= 0.9 \times 2100$

$= 1890$ seconds

unaffected = 10% $= 0.1 \times 2100 = 210$ seconds

$\therefore$ New Total Time = 2100/5

$= 420$ seconds

$\therefore T_{improved} = 1890/x + 210$

$= 420$

$1890/x = 420 - 210$

$x = 1890/210$

$\therefore x = 9$

$\therefore T_{new} = 1890/9$

$= 210$ seconds new password generation time.

(ii)

Original password generation time = 90% of 2100s

$T_{generation\ op.} = 0.9 \times 2100$

$= 1890$ sec

$T_{new} = 1890/9$

$= 210$ seconds. (Ans:)

(i)