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Ans: 1

$F_{memory} = 0.4$

$F_{disk} = 0.3$

and $S_1 = 4$; $S_2 = 4$

We know from Amdahls law,

$$\text{speed up} = \frac{1}{(1 - F_{memory} - F_{disk}) + \left(\frac{F_{memory}}{S_1}\right) + \left(\frac{F_{disk}}{S_2}\right)}$$

$$= \frac{1}{(1-0.4-0.3) + \left(\frac{0.4}{4}\right) + \left(\frac{0.3}{5}\right)}$$

$$= 2.17$$

Ans

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Ans: 2

Given,

frequency of Load an store,

$f_L = 33\%$

$f_S = 33\%$

Required access of memory for Load ~~and store~~ ~~instruction~~

for this program $= 0.33 \times 100 = 33$

and for store $= 0.33 \times 100 = 33$

~~Avg CPI = 0.33 × 1 + 0.33 × 1~~

Avg CPI $= 0.33 \times 1 + 0.33 \times 101 = 66.6$

For 2% cache miss

~~Avg CPI₂ = 0.33 × 0.98 × 0~~

Avg $CPI_2 = 0.33 \times 0.98 \times 3 + 0.33 \times 0.02 \times 103$

$= 1.65$

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So, Avg CPI_2 is much lower than Avg CPI thats why program with chache will run much faster than previous on.

here Avg $CPI_2 << $ Avg CPI

Ans

Ans:- 3

Instruction / Time steps	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ADD R3, R1, R2	F	D	E	W												
SUB R6, R2, R3		F	D		E	W										
AND M1, R5, 3			F		D	E	W									
ADD R1, R6, M1					F	D		E								
JMP NSU1						F		D	E	W						
NSU2: OR R2, R4, R7								F	D	E	W					
SUB R5, R3, R4									F	D	E	W				
ADD R0, R1, R10										F	D	E	W			
NSU1: LOAD R6, M2											F	D	E	W		
SUB R2, R1, R6												F	D	E	W	
JMP NSU2													F	D	E	W

Ans: 4

For compiler A,

instr.	ci	CPIi
div	1000	4
add	1000	1
load	1000	6
sub	1000	2

For compiler B,

instr.	ci	CPIi
add	3000	1
div	1000	4
sub	1000	2
load	1000	6

$$\text{Avg } CPI_A = \frac{1000\times4 + 1000\times1 + 1000\times6 + 1000\times2}{4000}$$

$$= 3.25$$

$$\text{Avg } CPI_B = \frac{3000\times1 + 1000\times4 + 1000\times2 + 1000\times6}{6000}$$

$$= 2.5$$

$$T_A = 4000 \times 3.25 \times \frac{1}{300\times10^6}$$

$$= 4.3\times10^{-5} \text{ sec}$$

$$T_B = 6000 \times 2.5 \times \frac{1}{300\times10^6}$$

$$= 5\times10^{-5} \text{ sec.}$$

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$$MIPS_A = \frac{300\times10^6}{3.25\times10^6} = 92.31$$

$$MIPS_B = \frac{300\times10^6}{2.5\times10^6} = 120$$

Ans

Ans :- 5

Given,

$T_{M1} = 2.5\ s$ and $T_{M2} = 2\ s$

$IC_{M1} = 100\times10^6$ and $IC_{M2} = 125\times10^6$

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(a) we Know,

$$T_{M1} = I_{M1} \text{ Avg } CPI_{M1} \times \frac{1}{f_{M1}}$$

$$\text{or, Avg } CPI_{M1} = \frac{T_{M1} \times f_{M1}}{I_{M1}}$$

$$= \frac{2.5 \times 800 \times 10^6}{100 \times 10^6} = 20$$

and

$$\text{Avg } CPI_{M2} = \frac{2 \times 1000 \times 10^6}{125 \times 10^6} = 16$$

(b)

Inst.	f_{M1}	f_{M2}	CPI_{old} $M1$	CPI_{old} $M2$	CPI_{New} $M1$	CPI_{New} $M2$
Add	0.4	0.6	20	16	5	5
MUL	0.1	0.08	20	16	20	25
CMP	0.2	0.12	20	16	20	16
SUB	0.3	0.2	20	16	20	16

(i)

$\cancel{I_{ADD_{New}}}$