

INSTITUTE OF INFORMATION TECHNOLOGY JAHANGIRNAGAR UNIVERSITY

Assignment : 01

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Course Tittle : Computer Architecture

Course Code : ICT - 2207

Submitted To

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Lecture

IIT-JU

Submitted By

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Roll-2023

2nd year 2st Semester

IIT - JU

Exercise: 2.10

 $CPI = \frac{\sum cPi \times I;}{Ic}$ $= \frac{45000 \times i + 32000 \times 2 + 15000 \times 2 + 8000 \times 2}{1,00000}$

= 1.55 Ans

MIPS rate = $\frac{Ic}{T \times 10^6}$ = $\frac{f}{CPI \times 10^6}$ = $\frac{40 \times 10^6}{1.55 \times 10^6}$ = 25.806 Am

Exception time = $Ie \times CPI \times I$: $= 100000 \times 1.55 \times \frac{1}{40 \times 10^6}$ = 0.00387 S = 3.87 ns

901 x (b + 5 + 3 + 01) (10 x (b + 5 + 4 x 10) = -

39.13

Exensiee 2.11

$$\underline{a} \cdot cpI_{A} = \frac{\sum cpI \times I_{i}}{I_{c}}$$

$$= \frac{(8 \times I + 4 \times 3 + 2 \times 4 + 4 \times 3) \times 10^{6}}{(8 + 4 + 2 + 4) \times 10^{6}}$$

$$MIPS_A = \frac{f}{cpi_A \times 10^6}$$

$$= \frac{200 \times 10^6}{2.22 \times 10^6}$$

$$= 90$$

$$cpu_{A} = \frac{Ic \times cpI_{A}}{f}$$

$$= \frac{18 \times 10^{6} \times 2.21 \times 110^{3} \text{ for a constraint}}{200 \times 10^{6}}$$

$$= 0.25$$

$$CPI_{B} = \frac{\sum cPI; \times I_{i}}{I_{c}}$$

$$= \frac{(10 \times 1 + 8 \times 2 + 2 \times 4 + 4 \times 3) \times 10^{6}}{(10 + 8 + 2 + 4) \times 10^{6}}$$

$$= 1.92$$

MIPSB =
$$\frac{f}{\text{cpIb} \times 10^6}$$

$$= \frac{200 \times 10^6}{1.92 \times 10^6}$$

$$= \frac{109}{f}$$

$$= \frac{29 \times 10^6 \times 1.92}{200 \times 10^6}$$

$$= 0.23 \text{ S}$$

6. Machine B has a higher MIPS than machine A. it requires a longer cpu time to execute the same set of benchmank Programs.

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Exentise: 2.12

We can express the MIPs nate as:

(MIPS nate)/10 = 1

.: Ic = T x (MIPS rate/10) 1130 x sI

The natio of the instruction count of the RS 160000 to the VAX is

 $[x \times 18] / [12x \times 1] = 1.5$ W. Machine B has a higher rups than machine A.

et medrines a source et mintere ti

CPI = 5 MHz/1MIPS 2003 211 = 5

For the Rs/6000

CPI = 25/18 = 1.39

In the land lie

A of Englishment 1.

Exercise: 2.13

MIPS = Icfrx106

Computer A Computer B computer c Program 1 100 10 5 Ongram 2 11.4 5 0.1 Program 311 2 0.2 21 0.1 1 1 0.125 Program 4 1 2.10

18.1

30 3 30 OV 1

HOSEF Harmonie Anithmetic Rank Rank mean mean Computer A 0.25 25.325 2 1 Computer B 3 2.8 3 0.21 Marie 1 2 Computer c 2.1 3.26

1.83 100 0071 35.3 21 1 363 00-1 03.1 10 1 00.1 3)'1

"

1 x - neiso : 2 - 13

Exen	cì	se	:	2.14	•

a Normalized to R

MIRS - Information

					501
Benchmank				Processor	
benchmank		ola Raso	9	Of CM, out	109000 2
E		1.00		011.71	201 3.11 monthers
F	1	1.00		1.19	10 1 19 (1000 200)
Н		1.00		1.0.43	20 0.49 maggi
1		1.00	1	11:11:05	0.60
k		1.00		2.10	2.09
Anithmetic mean		1.00		1.31	1.50
6 Norm	sile 25	ed to M	107	Smithametic nucon 25-325	
8	19		8	Processon	Computer B
Benchman	ιK,	R	6	M3 2 . 8	Computing c
E		0.59		1.00	1.82
F		0.84		1.00	1.00
14		2.32	-	1.00	1.13
1		0.90		1.00	0.54
K		0.48		1.00	1.00
Anithmeti mean	c	1.01		1.00	1.10
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C. Recall that the larger the natio the higher the speed. Based on (a) R is the slowest machine by a significant amount. Based on (b) M is the slowest machine by a modest amount.

d. Normalized to R.

6-1-1	Processon			
Benchmank -	R	M	7	
E	1.00	1.71	3.11	
F	1.00	1.19	1'19	
Н	1.00	0.43	0.49	
1	1.00	1. 11	0.60	
K	1.00	2.10	2.09	
Geometric mean	1.00	1. 15	1.18	

Normalized to M

(or most s		Processon	
Benchmank	R	m	7
E	0.59	1-00	1.82
F	0.84	1.00	1.00
H	2.32	1.00	1.13
T	0.90	1.00	0.54
ĸ	0.48	1.00	1.00
Cremetic	0.87	1.00	1.02

using the geometric mean R is the Slowest no matter which machine is used for normalization.

Arithmetic mean

mean

evermetric

1.25

Exercise: 2.15	in the co	y is fuice	Marking		
a Normalized	1 to x.	nd than a	for tend		
Ja Moil 21					
Benchmank	X	I A MY PIGO	7		
		2.0			
2	· muchanta	1 10050000	2.00		
Apithmetic mean	malite to	1;25	1:25		
Cheometric mean					
we find that I and I am : 58 taster					
Normalized to	Weren Training	ti west	X wast		
with to moone	1		CORP. Street War And Art Management of Contracting \$100 Street Services Services		
Benchmank	that x har	or Ysintes	6. Zung		
into want on	0.5	im I want	0.25		
2	2.0	-310 1Y 25	4:4.0 30		

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Machine y is twice as fost as machine x for benchmark 1 but half as fast for benchmark 2 machine 7 is half as X for benchmark 1 but twice as fast for benchmark 2 but twice as fast for benchmark 2. Intuitively these three machines have equivalent performance.

However if we normalize to n and compute the anithmetic mean of the speed metric we find that y and z are 25% faster than x. Now if we normalize to y and compute the mithmetic mean of the speed metric we find that x is 25% faster than y and z is more than twice as fast as y. Cleanly the anithmetic mean is worthless is this content.

2131 2m 33.

be when the geometric mean is used the three machines are shown to have equal Penformance when normalized to x and also equal Performance when normalized to y. These results are much more in line with our intuition.

Exercise: 2.16 with allows a 21 mint

a. Assuming the same instruction mix means that the additional instructions for each task shold be allocated Proportionally among the instruction type. So we have the following table.

Instruction Type	CPI	Instruction Min
Arithmetic and logic	2714 -200	60%
Load / Stone with cache hit	Andrew Control of the Park of	A PARTY NAMED AND POST OF THE PARTY NAMED AND
Branchillestos	L 7 4 - 0	12%
Memory neterence with Cache miss	0 + 12	10%

CPI = 06 + (2×0·18) + (4×0·12) + (12×0·1)

al. Doeil enguers miles some mentionest The CPI has increased due to the increased time for memory access.

with our intuition. D. MIPS = 400 2.64 = 152 There is a commesponding drop in the MIPS nate.

a Historian the same instruction or ix meshs that C. The speedup factor is the natio of the execution times, we calculate the execution time as T = Ie/ (MIPS X106) For signale-Prosson Case The = (2×106) 1 (178×106), Traitmenter

> = 11 ms. with 8 Processor each Processor executes 1/8 of the 2 million instruction plus the 25,000 overhead instructions

$$T_{9} = \frac{2 \times 10^{6}}{3} + 0.025 \times 10^{6}$$

$$152 \times 10^{6}$$

=1.8 ms

Therefore we have

Speedup =

time to execute Program on a single Processor

time to execute Program on N Panallel Processor

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A. Speedup = time to access in main memory
time to access in cache

$$=\frac{T_2}{T_1}$$

. The average access time can be computed as $T = H \times T_1 + (1-H) \times T_2$

Speedup = Execution time before enhancement

Execution time after enhancement $= \frac{T_2}{T_1} = \frac{T_2}{H \times T_1 + (1-H) \times T_2} = \frac{1}{(1-H) + H \frac{T_1}{T_2}}$

€ T= H x T1 + (1-H) x (T1+T2) where I = T1 + (1-H) × T2

Speedup = Execution time before enchancement

Execution time after enhancement

 $= \frac{T_2}{T_1} = \frac{T_2}{T_1 + (1-H)T_2} = \frac{1}{(1-H) + \frac{T_1}{T_2}}$

In this case the denominator is larger so that the speedup is less.

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