Assignment NO : 2

Name : Asad Khan

ID : 14944

Subject : Computer Architecture

Sumit To : Sir M. Amin

Department : BS(CS)

Semester. 4th

Name :- Asad Khan
ID :- 14944

Question No: 1
Give Answer each of the following:

Question No: 1(A)

Ans

Different desktop applications that require the great power of contemporary microprocessor based system are:

- ✓ Image processing
- ✓ Three dimensional rendering
- ✓ Speech recognition
- ✓ Videoconferencing
- ✓ Multimedia authoring
- ✓ Voice and video annotation of files
- ✓ Simulation modelling

Question No. 1(B)

Answer

The Techniques used in contemporary processors to increase speed are following:

Pipelining:

Pipelining enables a processor to

work simultaneously on multiple instructions by performing a different phase for each of the multiple instruction at the same time.

* Branch prediction:
Branch prediction potentially increases the amount of work available for the processor to execute.

* Superscalar execution:
This is the ability to issue more than one instruction in every processor clock cycle. In effect, multiple parallel pipelines are used.

* Data flow analysis:
The processor analyzes which instructions are dependent on each other's results, or data, to create an optimized schedule of instructions.

* Speculative execution:
This enables the processor to keep its execution engines

as busy as possible by executing instructions that that are likely to be needed.

Question No: 1(c)

Answer:-

Discuss the problem created due to increased in clock speed and logic desity of the processor are:-

- Power:

As the density of the logic and the clock speed on a chip increases so the power density increases and also dissipated the heat.

- RC delay:-

The speed at which electrons can flow on a chip between transistors is limited by the resistance and capacitance of the metal wires connecting them; specifically, delay increases as the RC product increases.

- Memory latency:-

Memory access speed (latency)

and Transfer Speed (Throughput) lag processor Speeds.

Question No: 1 (D)

Answer:.

The speedup using a parallel processor with N processors that fully exploits the parallel portion of the program is as follows:-

speedup = Time to execute program on a single processor / Time to execute program on N parallel processors.

$= T(1-f) + Tf/T(1-f) + Tf/N = 1/(1-f) + f/N$

Question No: 1 (E)

Answer:

Multicore:

* The use of Multiple processors on the same chip provides the potential to increase performance without increasing the clock rate.

* Strategy is to use two simpler

- Processors on the chip rather than one more complex processor.
- With two processors larger caches are justified.
- As caches became larger it made performance sense to create two and then three levels of cache on a clip. MIC:
- Leep in performance as well as the challenges in developing software to exploit such a large number of cores.
- The multicore and MIC strategy involves a homogeneous collection of general purpose processors on a single chip.

  Gpus.
- Core designed to perform parallel operations on graphics data.

  Traditionally found on a plug-in graphics card, it is used to encede and render 2D and 3D graphics as well

as process video.

- used as vector processors for a variety of applications that require repetitive computations.

Question No : 2

Solve each of the following.

2(A)

Answer:-

~~Effective CPI~~:

$CPI = (1*46000)+(2*33000)+(2*9160000)+(2*9000)/100$

$CPI = 162000/100$

$CPI = 1620$

~~Mips Rate~~:

MIPS rate = 60MHZ/1620*106

MIPS rate = 60*106/1620*106

MIPS rate = 60/1620

Mips rate = 0.037

Execution Time:

$T = IC / (MIPS * 10^6)$

$T = 104000 / (0.037 * 10^6)$

$T = 104000 / 37 * 10^3$

$T = 2811 * 10^{-3}$

$T = 2811 * 10^{-3}$

$T = 2.811$ sec

Question NO : 2 (B)

Answer:

For Machine A:

$CPI = (1*8 + 3*4 + 4*2 + 3*4) * 10^6 / (8+4+2+4) * 10^6$

$CPI = 40 * 10^6 / 18 * 10^6$

$CPI = 2.22$

MIPS rate $= 200\ MHz / 2.22 * 10^6$

MIPS rate $= 200 * 10^6 / 2.22 * 10^6$

MIPS rate $= 90$

$T = IC / MIPS * 10^6)$

$T = 18 * 10^6 / 90 * 10^6$

$T = 0.2$ sec

Name Asad Khan
ID 14944
page 08

For Machine B:

CPI = (1*10 + 2*8 + 4*2 + 3*4) * 106 /
(10 + 8 + 2 + 4) * 106

CPI = 46/24

CPI = 1.92

MIPS rate = 200 MHz / 1.92 * 106

MIPS rate = 200 * 106 / 1.92 * 106

MIPS rate = 104

T = Ic / (MIPS * 106)

T = 24 * 106 / 104 * 106

T = 0.23 sec

Question NO: 2(C)
C(a)

Answer

The MIPS rate could be computed as the following:

MIPS rate = IC/T * 106

Ic = MIPS rate * T * 106

Now by computing the ratio of

The instruction count of the IBM RS/6000 To the VAX 11/780 which is,

$18^{\circ}1 \times 10^{6} / 1^{\circ}/12 \times 10^{6}$

$= 18/12$

$= 1.5$

Question No : 2

C(b)

Answer

Regarding To the VAX 11/780, the

$CPI = (5MHz)/(1^{\circ}10^{6}) = 5^{\circ}(10^{6}/1^{\circ}10^{6}$

$= 5/1 = 5$

Regarding To the IBM RS/6000, the

$CPI = (25MHz)/(18^{\circ}10^{6}) = 25^{\circ}10^{6}/18^{\circ}10^{6}$

$= 25/18 = 1.4$

Question NO : 2 (D)

Answer

a- Determine the Average CPI.

Answer

Since we have the same instruction mix, that means the additional instruction for each task

could be allocated appropriately between the instruction types. Therefore, the following tables be gotten.

Instruction Type	CPI	Instruction Mix
Arithmetic and logic	1	60 %
Load/ Store with cache hit	2	18 %
Branch	4	12%
Memory reference with cache miss	12	10%

The average CPI = (1x0.6)+(2x0.18)+ (4x0.12)+(12x0.1) = 2.64. Therefore, the CPI has been increased since the time for memory access is also. Increased.

b. Determine the corresponding Maps rate.

MIPS= 400/2.64 = 152. There is a

corresponding drop in the MIPS rate

C. calculate the speedup factor.

The speedup factor equals to the ratio of the execution times. The execution time is calculated as the following: $T = Ic / (MIPS * 10^6)$.

for the one processor, $T_1 = (2 * 10^6) / (178 * 10^6) = \underline{11ms}$.

for the 8 processor, T each processor execute 1/8 of. the 2 million instructions plus the 25000

$T8 = 2 * 10^6 \div 8 + 0.025 * 10^6 / 152 * 10^6$

$T8 = \underline{18ms}$

Therfore we have

Speedup: Time to execute program on a single processor/ Time to execute program on N parallel processor

Speedup $= 11/1.8$

$\underline{\text{Speedup} = 6.11}$

Question 2 (D)(d)

By depending on the information given, it is not obvious (How To quantify this effect in Amdahl's equation.

Therefore, if it is supposed that that fraction of code, which is parallelizable is $f = 1$, then Amdahl's law decreases to speedup $= N = 8$.

Therfore,

The actual speedup is only abut 75% of the theoretical speedup