**SC2202 after-midterm assignment 3**

1.1) Consider a 4GHz clock cycled MIPS system with the following instruction types:

*Load* (5 clock cycles), *Store* (5 clock cycles), *R-type* (2 clock cycles), *Branch* (4 clock cycles), and *Jump* (3 clock cycles).

Assume that a program has 6000 R-type instructions, 1600 Load instructions, 1000 Store instructions, 1200 Branch instructions, and 200 Jump instructions. You can ignore any latency impact. Calculate its **CPI**, **CPU time** and **MIPS rate**.

1.2) Consider a 3GHz clock cycled MIPS system with the following instruction types:

*Load* (5 clock cycles), *Store* (5 clock cycles), *R-type* (2 clock cycles), *Branch* (4 clock cycles), and *Jump* (3 clock cycles).

Assume that a program has 40% R-type instructions, 15% Load instructions, 10% Store instructions, 25% Branch instructions, and 10% Jump instructions. You can ignore any latency impact. Calculate its **CPI**, **CPU time** and **MIPS rate**.

1.3) Consider a 0.25ns clock cycle timed MIPS system with the following instruction types:

*Load* (5 clock cycles), *Store* (5 clock cycles), *R-type* (2 clock cycles), *Branch* (4 clock cycles), and *Jump* (3 clock cycles)

Assume that a program has 50% R-type instructions, 20% Load instructions, 20% Store instructions, 5% Branch instructions, and 5% Jump instructions. Calculate its **CPI**, **CPU time** and **MIPS rate**.

1.4) Suppose that you have to choose between DP4600 (a 2-processor system) and H6600 (a 4-processor system) servers both are clocked at 2.4GHz. Assume that scheduling a task on both servers adds a sequential overhead which is 20% on H6600 server whereas on the DP4600, sequential overhead is only 10%. Which system is more efficient for running your task?

1.5) Consider a set of jobs are running on a corporate computer. We express the observations in a rate measure of jobs per hour. These data are 0.5, 0.45, 0.53 and 0.43 jobs per hour. What is the central tendency of these measurements?

1.6) An executing program is timed, and it is found that the I/O wait consumes **20s** of the time. You believe that by using parallel processors, you can improve the performance by a factor of **10**. What is the speedup of the system?

1.7) Assume that two computers (named A and B) are executing four loops of a scientific program with the following number of clock cycles (shown in **Table 1**). For a particular benchmark program, loop1 is executed 20 times, loop2 is executed 30 times, loop3 is executed 50 times and loop4 is executed 70 times. What is the mean speedup of the four loops (from A to B)?

|  |  |  |
| --- | --- | --- |
| **Loop** | **Comp A.** | **Comp B** |
| 1 | 40 | 30 |
| 2 | 50 | 20 |
| 3 | 30 | 25 |
| 4 | 24 | 15 |

**Table 1**

1.8) Consider a new CPU which is **10** times faster on computation than the original CPU. Assume that the original CPU is busy with I/O **40%** of the time. What is the overall speedup gained by incorporating the enhancement?

1.9) Find the number of dies per 30cm wafer for a die with 1.5cm side.