Exercises

**1 Please explain the following terms: (1) Response time (2) Execution time (3) Throughput (4) Benchmark**

**2 Every three years, the number of transistors in the computer increases by 4 times, and the performance (speed) of the CPU is directly proportional to the internal transistors and the maximum clock frequency. In 1996, the x586/200 CPU contained 3 million transistors with a clock frequency of 200MHz. If an x1486/800 CPU with an 800MHz clock frequency is released in 2002, how many times faster will it be than x586/200?**

**3 Try to explain the relationship between the execution speed of a computer and the amount of generation. What are the similarities and differences between the two?**

**4 It proves that the three factors of software, hardware structure, and hardware technology together affect computer performance.**

**5 Please try to explain how to compare the performance of different computers to be fair? Tell me your reasons.**

**6 Try to list the basic performance calculation formula for CPU calculation time and explain the meaning of each related variable.**

**Sol:**

**7 The performance of a P microprocessor with 100 MHz was evaluated by executing 10,000,000 evaluation program instructions, and it was found that it took 0.25 seconds. What are the CPI and MIPS data during this performance experiment?**

8 The data in the following table was measured on a machine with a clock period of 2.5ns. Suppose the compiler designed by this machine can perform optimizations so that 50% of the ALU operations can be removed (but not other classes).

|  |  |  |
| --- | --- | --- |
| Command Class | Frequency of occurrence | Clock Cycles (CPI) |
| ALU ops | 40％ | 1 |
| Load | 25％ | 2 |
| Store | 10％ | 2 |
| Branch | 25％ | 2 |

1. What are the differences between MIPS when considering the compiler performing optimization and not performing optimization?
2. Are the results of MIPS comparison with these two different modes the same as the results of CPU time? Please give examples to substantiate your claims.

Sol:

**9 Suppose we have two processors using the same instruction set, where processor A has a clock period of 1ns and a CPI of 2.5, and processor B has a clock period of 2 ns and a CPI of 1.5 under the same program. How much faster?**

**10 (1) What is Anderson's theorem? According to this theorem, what do the x, y, z parameters represent in the following formula?**

****

**(2) If 20% of the system can use parallel processing to improve performance by 50%, what is the overall system growth rate after improving that part with parallel processing?**

**11 There is a 500MHz processor, and the following is the data obtained after measurement**

|  |  |  |
| --- | --- | --- |
| Instruction set | CPI | frequency of use |
| A | 2 | 40% |
| B | 3 | 25% |
| C | 3 | 25% |
| D | 3 | 10% |

1. **What is the MIPS of this processor, please?**
2. **What is the CPI of this processor, please?**

**Later, the compiler performance of the processor was improved, and the following data was obtained**

|  |  |
| --- | --- |
| Instruction set | The improved percentage relative to the original frequency command |
| A | 90% |
| B | 80% |
| C | 85% |
| D | 90% |

1. **For the same program, what is the CPI if the improved compiler is used?**
2. **How much faster is it to use the improved compiler compared to the improved one?**

**12 Please judge whether it is most cost-effective to buy a computer M1 or a computer M2, where the M1 clock is 1GHz and the M2 clock is 500MHz**

|  |  |  |
| --- | --- | --- |
| Instruction set | CPI for M1 | CPI for M2 |
| A | 4 | 2 |
| B | 6 | 4 |
| C | 8 | 3 |

1. **Compare the MIPS of the two processors.**
2. **If there are three compilers C1, C2, and C3, and the frequencies used are as follows**

|  |  |  |  |
| --- | --- | --- | --- |
| Instruction set | C1 | C2 | C3 |
| A | 30% | 30% | 50% |
| B | 50% | 20% | 30% |
| C | 20% | 50% | 20% |

* **If both computer M1 and computer M2 use compiler C1, who is faster? How much faster?**
* **Assuming that both computers can use the above three compilers, how to combine them to get the most benefits?**

**13 What is the role of the Effectiveness Evaluation Process? What kind of problems may it face?**