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| Instructor |  | Due Date |  |

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| Part | **1** | **2** | **3** | **4** | Total |
| *Maximum Points* | **25** points | **25** points | **25** points | **25** points | **100**G101010 pointsG |
| ***Your Score*** |  |  |  |  |  |

**Textbook Reading Assignment**

Thoroughly read Chapter(s) 11 in your Computer Architecture and Organization textbook.

**Part 1 Glossary Terms - Performance Measurement and Analysis**

Define, in detail, each of these glossary terms from the realm of computer architecture and computer topics, in general. If applicable, use examples to support your definitions. Consult your notes

or course textbook(s) as references or the Internet by visiting Web sites such as:

[**http://www.ask.com**](http://www.ask.com) or [**http://www.webopedia.com**](http://www.webopedia.com/)

**(a) Delayed branching**

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**(b) Elevator Algorithm**

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**(c) FLOPS**

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**(d) Loop Peeling**

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**(e) SSTF**

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**Part 2 Exercises - Performance Measurement and Analysis**

For each of the following, enter True or False.

\_\_\_\_\_ **(1)** Mathematical and statistical tools give us many ways to rate the overall performance of a system and its components.

\_\_\_\_\_ **(2)** A CPU running at double the clock speed of another is likely to give better CPU throughput.

\_\_\_\_\_ **(3)** Branch prediction is the process of attempting to guess the next instruction in the instruction stream.

\_\_\_\_\_ **(4)** Disk scheduling can be a function of either the disk controller or the host operating system.

\_\_\_\_\_ **(5)** The elevator algorithm works much similar to how skyscraper elevators service their passengers.

\_\_\_\_\_ **(6)** When throughput is more important than reliability, a system may employ the write - back cache policy.

\_\_\_\_\_ **(7)** More time - consuming programs have greater influence on the harmonic mean.

\_\_\_\_\_ **(8)** Clock speed, MIPS and FLOPS are the metrics in comparing relative performance across a line of similar computers offered by the same vendor.

\_\_\_\_\_ **(9)** Simulation is very useful for estimating the performance of systems or system configurations that only exist.

\_\_\_\_\_ **(10)** Disk utilization, the measure of the percentage of time that the disk is busy servicing I / O requests.

**Part 3 Exercises - Performance Measurement and Analysis**

**(1)** **( Mean Values )**

Some types of averages include the arithmetic mean, the geometric mean and the harmonic mean.

The arithmetic mean is defined as the sum of the data values divided by their count.

The geometric mean of *n* positive numbers is the *n* - th root of their product.

The harmonic mean of *n* numbers is the reciprocal of the sum of the reciprocals of the numbers.

The execution times for a system running four benchmarks is shown in the table below. Compute the arithmetic, geometric and harmonic means of this data.

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| --- | --- |
| *program* | System A Execution Time |
| W | 60 |
| X | 85 |
| Y | 70 |
| Z | 90 |

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**(2)** **( Benchmarks and the Geometric Mean )**

The execution times for three systems running five benchmarks are shown in the table below. Compare the relative performance of each of these systems ( i.e., A to B , B to C

and A to C ) using the arithmetic and geometric means. Are there any surprises? Explain your analysis.

|  |  |  |  |
| --- | --- | --- | --- |
| *program* | System A  Execution Time | System B  Execution Time | System B  Execution Time |
| V | 150 | 200 | 80 |
| W | 200 | 250 | 150 |
| X | 275 | 170 | 200 |
| Y | 400 | 750 | 500 |
| Z | 900 | 1100 | 1200 |

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**(3)** **( Benchmarks and the Geometric Mean )**

The execution times for three systems running five benchmarks are shown in the table below. Compare the relative performance of each of these systems ( i.e., A to B , B to C

and A to C ) using the arithmetic and geometric means. Are there any surprises? Explain your analysis.

|  |  |  |  |
| --- | --- | --- | --- |
| *program* | System A  Execution Time | System B  Execution Time | System B  Execution Time |
| V | 40 | 100 | 70 |
| W | 325 | 275 | 350 |
| X | 275 | 100 | 300 |
| Y | 400 | 200 | 400 |
| Z | 800 | 1000 | 600 |

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**(4)** **( Synthetic versus Real - World Benchmarks )**

Comment on any effectiveness of synthetic benchmarking versus real - world benchmarking.

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**(5)** **( Performance Factors )**

Discuss some of the factors that affect the performance of processors, programs and magnetic disk storage.

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**Part 4 Exercises - Performance Measurement and Analysis**

Write a complete answer for each of these.

**(1) ( Benchmarks )**

What would you say to a vendor that tells you that his system runs 50 % of the SPEC benchmark kernel programs twice as fast as the leading competitive system? Which statistical fallacy is at work here?

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**(2) ( Synthetic Benchmarks )**

What are the limitations of synthetic benchmarks such as Whetstone and Dhrystone?   
 Do you think that the concept of a synthetic benchmark could be extended do overcome these limitations? Explain your answer.

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**(3) ( The Retail Business Sector )**

Besides the retail business sector, what other organizations would need good performance from a transaction - processing system. Justify your answer.

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**(4) ( Comparing Computer Models )**

Suppose a friend has asked you to help him to make a choice as to what kind of computer he should buy for his personal use at home. What would you look for in comparing various makes and models? How does your line of thinking differ in this situation than if you were to help your employer purchase a Web server to accept customers’ orders over the Internet?

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**(5) ( Branching Predictors )**

In reference to branching, static prediction and fixed prediction are the same. Explain why this is so.

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