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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) 7 in your Computer Architecture and Organization textbook.

**Part 1 Glossary Terms - Input / Output and Storage Systems**

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) Amdahl’s Law**

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**(b) Data Compression**

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**(c) I / O Architectures**

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**(d) RAID**

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**(e) Transmission Modes**

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**Part 2 Exercises - Input / Output and Storage Systems**

For each of the following, enter True or False.

\_\_\_\_\_ **(1)** A standard monitor is the only output device that presents results to the user.

\_\_\_\_\_ **(2)** The simplest way for a CPU to communicate with an I / O device is through polled I / O .

\_\_\_\_\_ **(3)** Channel I / O is a type of non - isolated I / O because the systems are equipped with separate I / O buses.

\_\_\_\_\_ **(4)** Two types of transmission modes are serial and parallel transmission modes.

\_\_\_\_\_ **(5)** Rewritable optical media replace the dye and reflective coating layers of a CD - R disk with a non - metallic alloy.

\_\_\_\_\_ **(6)** The storage systems that are not protected by RAID are known as just a bunch of disks ( JBOD ) .

\_\_\_\_\_ **(7)** RAID Level 1 , or RAID - 1 , is also known as disk mirroring.

\_\_\_\_\_ **(8)** A hologram is a three - dimensional image rendered by the manipulation of laser beams.

\_\_\_\_\_ **(9)** Memristor memories are a type of volatile RAM .

\_\_\_\_\_ **(10)** The I / O modules take care of data movement between main memory and a particular device interface.

**Part 3 Exercises - Input / Output and Storage Systems**

**(1)** **( Amdahl’s Law )**

Amdahl’s Law is given by the equation:

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| *S* = | 1 |
| ( 1 − *f* ) + *f*  / *k* |

where

*S* is the overall speedup

*f* is the fraction of work performed by a faster component

*k* is the speedup of the faster component.

Calculate the overall speedup of a system that spends *f* = 65 % of its time on I / O with a disk upgrade that provides for 50 % greater throughput ( with *k* = 1.5 ) .

**(2)** **( Amdahl’s Law )**

Calculate the overall speedup of a system that spends 40 % of its time in calculations with a processor upgrade that provides for 100 % greater throughput.

**(3)** **( Amdahl’s Law )**

Suppose that you are designing a game system that responds to players' pressing buttons and toggling joysticks. The prototype system is failing to react in time to these input events, causing noticeable annoyance to the gamers. You have calculated that you need to improve overall system performance by 50 % . This is to say that the entire system needs to be 50 % faster than it is now. You know that these I / O events account for 75 % of the system workload. You figure that a new I / O interface card should do the trick. If the system's existing I / O card runs at 10 kHz ( pulses per second ) , what is the speed of the I / O card that you need to order from the supplier?

**(4)** **( Amdahl’s Law )**

Your friend has just bought a new personal computer. She tells you that her new system runs at 1GHz , which makes it over three times faster than her old 300 MHz system. What would you tell her? ( Hint: Consider how Amdahl's Law applies. )

**(5)** **( I / O Architectures )**

Name the four types of I / O architectures. Where are each of these typically used and why are they used there?

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**Part 4 Exercises - Input / Output and Storage Systems**

Write a complete answer for each of these.

**(1) ( Seek Time, Rotational Delay, Transfer Time )**

Define the terms seek time, rotational delay and transfer time. Explain their relationship.

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**(2) ( Random Access Device )**

Why do you think the term random access device is something of a misnomer for disk drives?

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**(3) ( Disk Directories )**

Why do differing systems place disk directories in different track locations on the disk? What are the advantages of using each location that you cited?

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**(4) ( Hard Disk Capacity )**

Suppose a disk drive has the following characteristics:

• 4 surfaces

• 1024 tracks per surface

• 128 sectors per track

• 512 bytes / sector

• track - to - track seek time of 5 milliseconds

• rotational speed of 5000 RPM

(a) What is the capacity of the drive? Hint: use this product.

? surfaces × ? tracks per surface × ? sectors per track × ? bytes / sector

(b) What is the access time? Hint: use this expression.

Rotational Delay = [ ( ? secs / ? rpm) × ( ? ms / second ) ] / 2 + ? ms seek time

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**(5) ( Hard Disk Capacity )**

Suppose a disk drive has the following characteristics:

• 5 surfaces

• 1024 tracks per surface

• 256 sectors per track

• 512 bytes / sector

• track - to - track seek time of 8 milliseconds

• rotational speed of 7500 rpm

(a) What is the capacity of the drive?

(b) What is the access time?

(c) Is this disk faster than the one described in question 17 ? Explain.

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