



THE UNIVERSITY OF ZAMBIA

School of Natural Science

Department of Computer Science

FINAL EXAMINATION

CSC 2101: INTRODUCTION TO COMPUTER SYSTEMS

Date: Wednesday, 30th December 2020
Time: 09:00hrs – 12:00hrs
Duration: 3 Hours
Venue: NSLT

Instructions

1. There are **Five (5)** questions and two (2) sections in this paper.
2. Each question carries **25 marks**,
3. *You are required to answer a total of Four (4) Questions*
 - a. *Answer all the questions in Section A*
 - b. *Choose one (1) question from Section B*

SECTION A

This Section has Three Questions. Answer all the questions

Question 1

- a) Briefly describe each of the following [3 Marks]
- Computer System
 - Computer Architecture
 - Computer Organisation
- b) A video port connects a monitor cable to a computer. Display cables on the other hand transfer video signals from the computer to display devices. Name the five major video ports and connector types shown in the diagram below (A, B, C, D, E) [5 Marks]
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- The diagram shows five different video port connectors.
A: Mini DisplayPort (Thunderbolt)
B: Mini-HDMI
C: DVI-D (Digital Visual Interface)
D: HDMI
E: VGA (Video Graphics Array)
- c) Malicious software (malware) is any software designed to damage or to disrupt a system. Briefly describe each of the following types of malware [5 Marks]
- Adware
 - Spyware
 - Viruses
 - Worms
 - Trojan Horses
- d) Upon completion of your second-year courses in Computer Science degree programme at the University of Zambia, you have been awarded the 2 months internship job at our power utility company called ZESCO. Your job description will largely be a computer system engineer. The tasks include working at the help desk, repair and troubleshooting of the computers, printers, copiers, switches and routers. In this type of work, injury prevention is everyone's responsibility and part of the company work policy. You will therefore need to stay alert to situations that could result in an injury. Based on what you learnt in the computer systems course, **developing and using safe work practices** is by far the best method for preventing injuries in the workplace. [12 Marks]
- Explain the purpose of safe working conditions and procedures
 - Identify safety procedures to protect equipment from damage and data from loss
 - Identify safety procedures to protect the environment from contamination

Question II

- a) Upon graduation in computer science at the University of Zambia, you have been employed to work at the call center at the telecommunication company. The use of communication skills to determine customer problem is an important aspect for you as an expert. One of the first tasks for you as a technician is to determine the type of computer problem or phone problem that the customer is experiencing. Describe the key steps needed as a technician to determine the customer problem [4 Marks]
- b) Power cables are used to distribute electricity from the power supply to the motherboard and other components. Give the function of each of the following power cables below and the components to which they supply power [5 Marks]



ATX



AUX



SATA



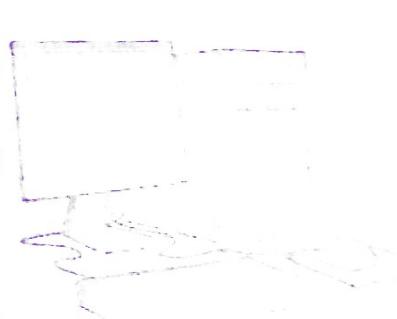
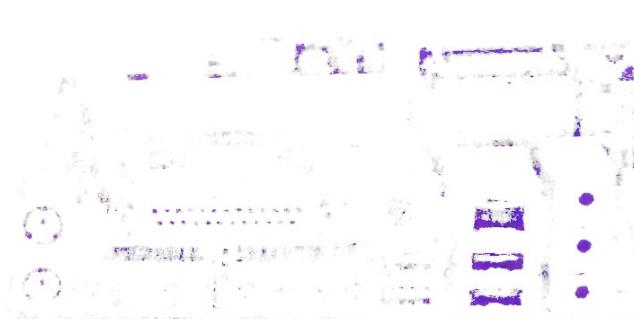
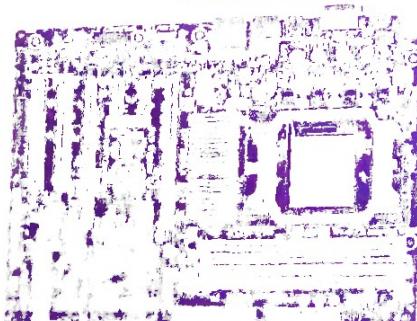
Molex



Berg

- c) Monitors and Projectors are the major display technologies used in computer systems. Briefly discuss each of the following technologies [5 Marks]
- Cathode-ray tube (CRT)
 - Liquid crystal display (LCD)
 - A light-emitting diode (LED)
 - Plasma
 - Digital Light Processing

- d) The University of Zambia with more than 2000 employees has given you a Job as an intern. You have been attached to the support centre department. Your role will be upgrading old desktop computers, servers and Laptop computers for the university workers. Using your knowledge in the computer systems course, you know that it is important to work in a logical, methodical manner when working with computer components. Using the diagram of the motherboard shown below [11 Marks]
- Name and List the major hardware components that make up a desktop computer.
 - Explain how you would go about to assemble the components list in (i) above in a logical, methodical manner to come up with a working computer using the motherboard below



Question III

a) Mobile devices organize icons and widgets on multiple screens for easy access. Android Operating System uses the system bar, displayed on the bottom of the screen, to navigate apps and screens. Describe each of the following features with respect to IOS and Android mobile operating systems [4 Marks].

- i. Widgets
- ii. Notification Centre
- iii. Screen Orientation
- iv. Screen Calibration



b) A mobile device is any device that is hand-held, light, and typically uses a touchscreen for input. Most mobile devices use touchscreens to allow users to physically interact with the screen and type on a virtual keyboard. Briefly discuss each of the following types of touch screens below [4 Marks];

- i. Capacitive
- ii. Resistive



- c) On 31 December 2019, the World Health Organization was informed of a cluster of cases of pneumonia of unknown cause detected in China. A novel coronavirus SARS coronavirus-2 was subsequently identified from patient samples. The outbreak of respiratory disease has now been detected in more than 70 locations internationally, including Zambia. The virus has been named “SARS-CoV-2” and the disease it causes has been named “Coronavirus Disease 2019” (abbreviated “COVID-19”). The University of Zambia has been requested by the government to help test the level of infection in four districts in Lusaka Province as shown in the spreadsheet below. Four Schools and four districts are participating on the project [17 Marks].

A	B	C	D	E	F	G	H	I
No.	UNZA - SCHOOL	Districts				Average		
		Kafue	Chongwe	Lusaka	Chilanga			
1	UNZA Vet Medicine	71.0	77.0	83.0	74.0			
2	UNZA Public Healthy	75.0	72.0	81.0	69.0			
3	UNZA School of Medicine	73.0	78.0	80.0	75.0			
4	UNZA N/S (CS & Biology Dept.)	68.0	76.0	85.0	72.0			
	Lowest COVID-19 Infection							
	Highest COVID-19 Infection							
	Average COVID-19 Infection							

Copy and Complete the Table by writing the formulae to compute the following

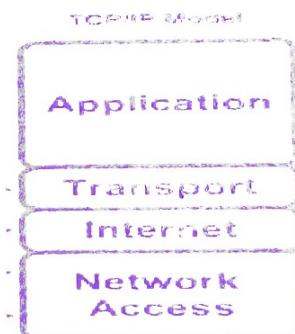
- Give the formula that can be used to compute the following
 - The Lowest infection level in each District
 - The Highest infection level in each District
 - The Average infection level in each District
- The formula used to compute the average level of infection from all the samples collected by each School
- Which District has the highest COVID-19 Infection?
- Which District has the least COVID-19 Infection?

SECTION B

This Section has TWO Questions. Choose one question

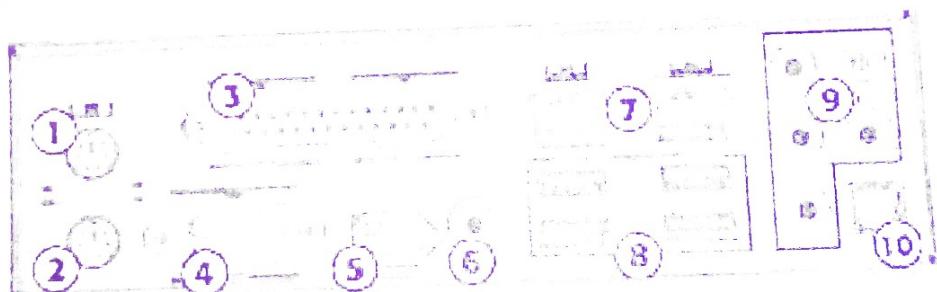
Question I

- a) Latency is the amount of time it takes data to travel from source to destination. Data is transmitted in one of three modes. Discuss each of the following transmission modes [3 Marks]
- Simplex
 - Half-duplex
 - Full-duplex
- b) Briefly describe each of the following types of Computer Networks [4 Marks]
- Local Area Network (LAN)
 - Metropolitan Area Network (MAN)
 - Wireless Local Area Network (WLAN)
 - Wide Area Network (WAN)
- c) The OSI model and the TCP/IP model are both reference models used to describe the data communication process. The TCP/IP model *as shown in the diagram below* is used specifically for the TCP/IP suite of protocols and the OSI model is used for development of standard communication for equipment and applications from different vendors [10 Marks].
- Draw a well labelled similar diagram showing the **7 layers of the OSI Model**
 - Give the function of each layer of the OSI Model



- d) An Operating System (OS) is an interface between a computer user and computer hardware. It is a software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers [8 Marks]
- Give two examples of open-source operating systems and two examples of non-open-source operating systems
 - Describe each of the following categories of the operating systems by giving the major characteristics and at least one example in each case
 - Desktop Operating System
 - Network Operating System

Question II

- a) To connect to the Internet and other devices, Laptop computers use several different communication methods as shown in the diagram below. Briefly discuss each of the following communication methods below [3 Marks]
- Bluetooth
 - Infrared
 - Wi-Fi
- b) The troubleshooting process is a guideline to help solve computer problems in a logical and efficient manner. Usually these are grouped into six (6) major steps. Step 1 to Step 4 have been given below. List and describe the last two steps [4 Marks]
- *Step 1: Identify the problem*
 - *Step 2: Establish a theory of probable cause*
 - *Step 3: Test the Theory to Determine cause*
 - *Step 4: Establish a Plan of Action to Resolve the Problem and Implement the solution*
 - *Step 5:*
 - *Step 6:*
- c) The diagram below shows the backend of the desktop computer. Identity and give the function of each of the ten ports below [10 Marks]
- 
- The diagram shows the rear panel of a desktop computer with ten numbered ports. The ports are arranged as follows: two circular ports at the top left, one rectangular port labeled '3' in the center, five ports in a row at the bottom left, and three ports in a column on the right side.
- d) System utility software is a set of tools that helps configure, analyse and optimize computer resources to help users perform multiple tasks efficiently. It is software designed to help to analyse, configure, optimize or maintain a computer. Utility software is used to support the computer infrastructure in contrast to application software, which is aimed at directly performing tasks that benefit ordinary users. Briefly discuss each of the following Windows Operating System utility software tools below [8 Marks]
- Disk Management Utility
 - The System Utility
 - Device Manager
 - Event Viewer

End of the Examination

THE UNIVERSITY OF ZAMBIA, SCHOOL OF NATURAL SCIENCES

DEPARTMENT OF COMPUTER SCIENCE

2019/2020 CSC 2111 TEST 2

INSTRUCTIONS: Answer ALL questions. **DURATION: 2 HRS**

QUESTION ONE

Consider a machine with a byte addressable main memory of 2^{16} bytes and block size of 8 bytes.

- i. What is the *number* and *range* of addressable locations in the main memory? [4 marks]
- ii. Assuming that a direct mapped cache consisting of 32 lines is used with this machine,
 - a. How is a main memory address divided into tag, line, and word values? [6 marks]
 - b. Into what line would bytes with each of the following addresses be stored? [6 marks]
 - i. 0001 0001 0001 1011
 - ii. 1100 0011 0011 0100
 - iii. 1101 0000 0001 1101
 - c. Suppose the byte with address 0001 1010 0001 1010 is stored in the cache.
What are the addresses of the other bytes stored along with it? [4 marks]

QUESTION TWO

Assuming that a four-way set-associative mapped cache consisting of 32 lines is used with the machine from question one,

- a. How is a main memory address divided into tag, set, and word number? [6 marks]
- b. Into what set would bytes with each of the following addresses be stored? [4 marks]
 - i. 0001 0001 0011 1011
 - ii. 1100 0011 0010 0100

iii. 1101 0000 0001 1101

iv. 1010 1010 1010 1010

QUESTION THREE

In relation to main memory error correction functions:

- i. Develop a SEC code for a 10-bit data word. (*Set up a table*) [10 marks]
- ii. Generate the code for the data word 0101101011. [5 marks]
- iii. Show that the code will correctly identify an error in data bit 5. [5 marks]

QUESTION FOUR

Discuss the disk layout below. [10]

