University of Eswatini

Department of Computer Science

Resit Examination

2018/19

Title of Paper: Computer Architecture & Organisation I

Course Number: CSC222

Time Allowed: Three (3) hours

Instructions: Answer **ALL** questions

You are not allowed to open this paper until you have been told to do so by the invigilator.

QUESTION ONE (24 marks)

SCENARIO

As a Computer Science student at the University of Eswatini, you have been nominated to assist in the upcoming National Universities sports competitions to be hosted at Somhlolo Stadium. As part of the preparation for this event there will be meetings held in all the participating universities across the country. All the organizers in each participating university need to set up computer systems to be able to manage and process the vast amount of data that will be obtained from the registration of the athletes as well as the results for each event. Volunteers from the local communities and schools also have offered their assistance.
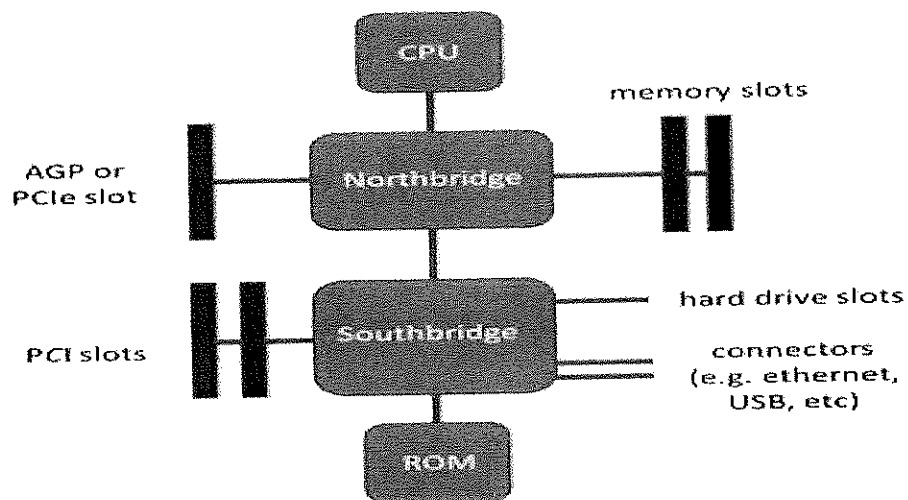

Diagram 1 represents some of the components of the computer motherboard, and as a computer designer you are expected to explain some of the components to the volunteers by answering the following questions:

1.1) What are the major differences between DRAM and SRAM? **(3)**

1.2) What are the characteristics EPROM (Erasable and Programmable Read Only Memory)? **(2)**

One of the organizers is an enthusiastic supporter of open-source software.

1.3) What are the differences between open-source software and freeware in terms of any THREE of the following aspects? Use the table below. **(4)**

- What is included in the package

- Means of distribution

- Support

- Availability of upgrades

	Open Source Software	Freeware Software
What is included in the package		
Means of distribution		
Support		
Availability of upgrades		

1.4) Explain the difference between the licensing of freeware and shareware.

(2)

A cellphone company offered to supply smartphones to the organizers at the different centers.

1.5) Name ONE operating system developed exclusively for use on smartphones. **(1)**

1.6) Describe THREE responsibilities of the operating system of a computer system regarding the management of memory. **(3)**

1.7)   Some of the organizers complained that some websites show less content when displayed on the smartphones, compared to displaying them on regular PCs. Give a possible reason for the seemingly missing content. **(2)**

Data stored about the athletes must be protected against loss or damage. Although backups will be made regularly, data can still be lost due to unexpected power failures.

1.8)   Suggest how the loss of data due to unexpected power failures can be prevented. **(1)**

1.9)   Give TWO reasons, other than power failures, for the loss of or damage to data. For each reason, suggest a measure that can be adopted to prevent the loss or damage of data. **(4)**

1.10) Give TWO reasons why the local hard drive of a PC will not be suitable for backup purposes. **(2)**

QUESTION TWO (20 marks)

Define the following concepts using examples:

2.1) Pipelining **(3)**

2.2) Branch prediction **(3)**

2.3) Superscalar execution **(3)**

2.4) Data flow analysis **(3)**

2.5) Speculative execution **(3)**

2.6) Performance Balance **(3)**

2.7) Direct Memory Address **(2)**

QUESTION THREE (31 marks)

The basic function performed by a computer is execution of a program, which consists of a set of instructions stored in memory. The processor does the actual work by executing instructions specified in the program.

With the aid of diagrams describe the following:

3.1) The basic instruction Cycle. (10)

3.2) The instruction cycle with interrupts. (15)

3.3) The major components of the CPU/processor. (6)

Question FOUR (25 marks)

4.1) Some processors use memory mapped I/O where I/O devices are in the same address space as main memory. Others have separate I/O address space and separate instructions. Give some advantages and disadvantages of each. (6)

4.2) Although DMA does not use the CPU, the maximum transfer rate is still limited. Consider reading a block from the disk. Name three factors that might ultimately limit the rate transfer. (3)

4.3) List and briefly discuss the key services provided by an OS. (8)

4.4) Briefly describe the major types of OS scheduling. (8)