



# THE UNIVERSITY OF ZAMBIA

## DEPARTMENT OF COMPUTER SCIENCE

2015/2016 TERM 1

CSC2111 TEST 1

14<sup>TH</sup> DECEMBER 2015      Duration: 1 hour 30 mins

### Question 1

1. What, in general terms, is the distinction between computer structure and computer function? **[2 marks]**
2. What are the four main functions of a computer? **[2 marks]**
3. Draw a diagram showing the functional view of the computer. **[4 marks]**
4. List and briefly define the main structural components of a computer. **[4 marks]**
5. Convert the following hexadecimal numbers to their binary equivalents: **[4 marks]**
  - a. EF
  - b. 45
6. Convert the following binary numbers to their hexadecimal equivalents: **[4 marks]**
  - a. 1101010
  - b. 100011

### Question 2

1. Explain Moore's law and discuss its implications. **[5 marks]**
2. Give 2 examples of embedded systems and state their markets. Each example should be taken from a different market. **[2 marks]**
3. List and explain 3 key characteristics of a computer family. **[6 marks]**
4. What is a benchmark in computer science? Give an example. **[2 marks]**
5. Consider a memory organization with a 32-bit memory addresses and word length of 8 bytes. What is the 3<sup>rd</sup> byte number of seventh last word? **[5 marks]**

### Question 3

1. What general categories of functions are specified by computer instructions? **[4 marks]**
2. List and briefly define one approach to dealing with multiple interrupts. **[1 mark]**
3. Explain the types of transfers a computer's interconnection structure (e.g., bus) must support? **[5 marks]**
4. Draw a diagram showing the bus configuration for a high performance architecture. **[4 marks]**
5. List any 3 elements of bus design that serve to classify buses and give their sub parameters **[3 marks]**

#### **Question 4**

1. Draw a 3-level cache organization indicating which is fast and that which is slow. **[4 marks]**
2. Differentiate logical and physical caches using a diagrams. **[6 marks]**
3. List and explain 2 elements of cache design. **[4 marks]**
4. Differentiate the LRU & LFU replacement algorithms giving examples using time and frequency where possible. **[6 marks]**



THE UNIVERSITY OF ZAMBIA  
SCHOOL OF NATURAL SCIENCES  
DEPARTMENT OF COMPUTER SCIENCE

2014/2015 TERM 1

CSC2111 TEST 1

12<sup>TH</sup> DECEMBER 2014

Duration: 2 hours

Answer all questions.

**Question 1**

1. What, in general terms, is the distinction between computer organization and computer architecture? [4 marks] ✓
2. What are the four main functions of a computer? [2 marks] ✓
3. Draw a diagram showing the functional view of the computer. [5 marks] ✓
4. List and briefly define the main structural components of a processor. [4 marks] ✓
5. Draw a diagram showing the components of a control unit. [3 marks] ✓
- \* 6. Convert the following hexadecimal numbers to their binary equivalents: [6 marks] .
  - a. D52 b. 239
- \* 7. Convert the following binary numbers to their hexadecimal equivalents: [6 marks]
  - a. 001001 b. 10100111

**Question 2**

- \* 1. What is a stored program computer? [2 marks] ✓
- \* 2. At the integrated circuit level, give the three principal constituents of a computer system and state their function? [6 marks]
- \* 3. Explain Moore's law and discuss its implications. [5 marks]
- \* 4. Give 5 examples of embedded systems and state their markets. Each example should be taken from a different market. [5 marks]
- \* 5. What is the key distinguishing feature of a microprocessor? [1 mark]

1

$$\begin{array}{r} 2 \underline{5} \\ 2 \\ 1 \\ 0 \\ 1 \end{array} \quad \begin{array}{l} A = 10 \\ B = 11 \\ C = 12 \\ D = 13 \end{array} \quad \begin{array}{r} 2 \underline{3} \\ 1 \\ 1 \\ 0 \\ 1 \end{array}$$

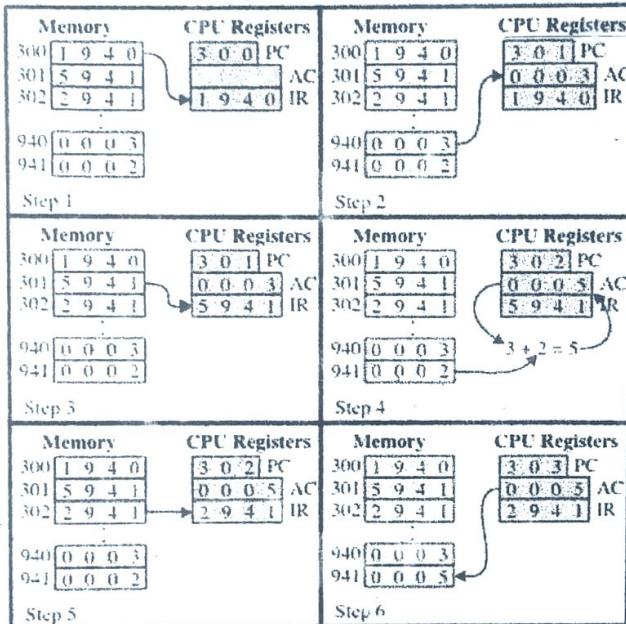
6. What is a benchmark in computer science? Give an example. [2 marks]

7. State Amdahl's law? [1 mark]

8. Consider a memory organization with a 16-bit memory addresses and word length of 4 bytes. What is the fifth last word #? [4 marks]

### Question 3

- Q 1. Using the diagram below list and briefly define the possible states that define an instruction execution. [7 marks]



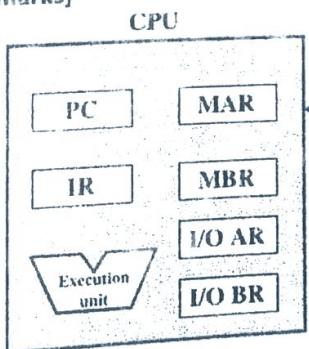
2. State and explain the 4 classes of interrupts. [4 marks]

3. What is the control bus and what kind of signals can it transmit? [4 marks]

4. Draw a diagram showing the bus configuration for a high performance architecture. [4 marks]

5. List the 4 elements of bus design that serve to classify buses and give their sub parameters [8 marks]

6. Define and state the function of each of the components shown in the CPU below. [7 marks]



#### Question 4

1. List and explain 2 key characteristics of computer memory systems. [4 marks]
2. What are the differences among sequential access, direct access, and random access? [6 marks]
3. What is the general relationship among access time, memory cost, and capacity? [2 marks]
4. Draw a diagram showing a typical cache organization in relation to the processor and the system bus. [5 marks]
5. List and explain 2 elements of cache design. [4 marks]
6. What is victim cache? [1 mark]
7. Explain what write-through and write-back are giving the potential problems for each of these policies. [4 marks]
8. Define unified cache and split cache. [2 marks]



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## DEPARTMENT OF COMPUTER SCIENCE

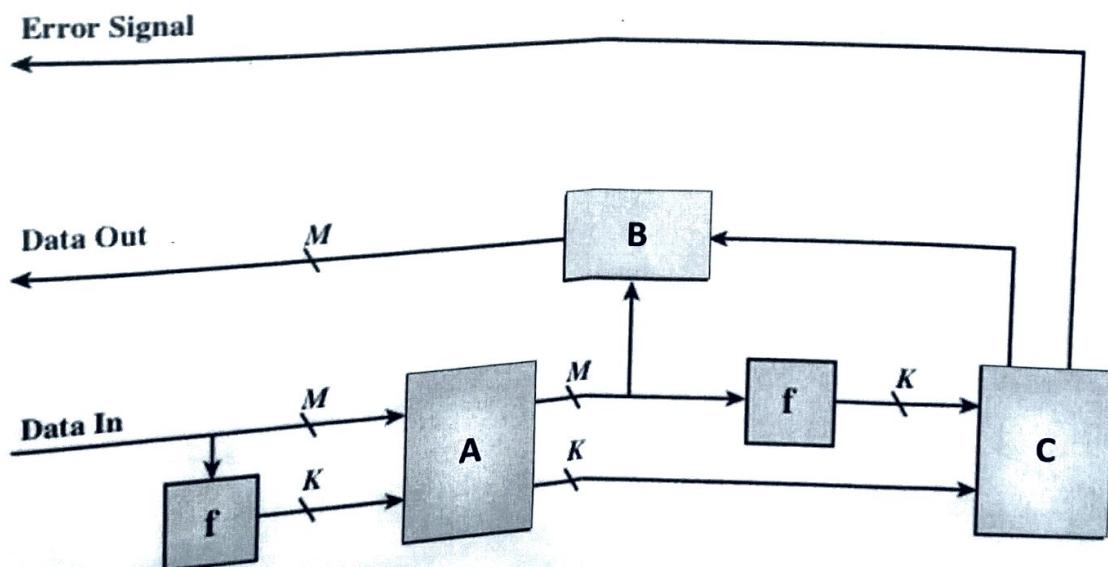
2015/2016 TERM 1

CSC2111 TEST 2

Duration: 1 hour

### Question 1

1. Give 2 key properties of semiconductor memory? [2 marks]
2. What is the difference between EPROM and EEPROM [7 marks]
3. The diagram below shows how error correction is normally set up in computers. If  $f$  represents the error correction function, label the components A, B and C [3 marks]

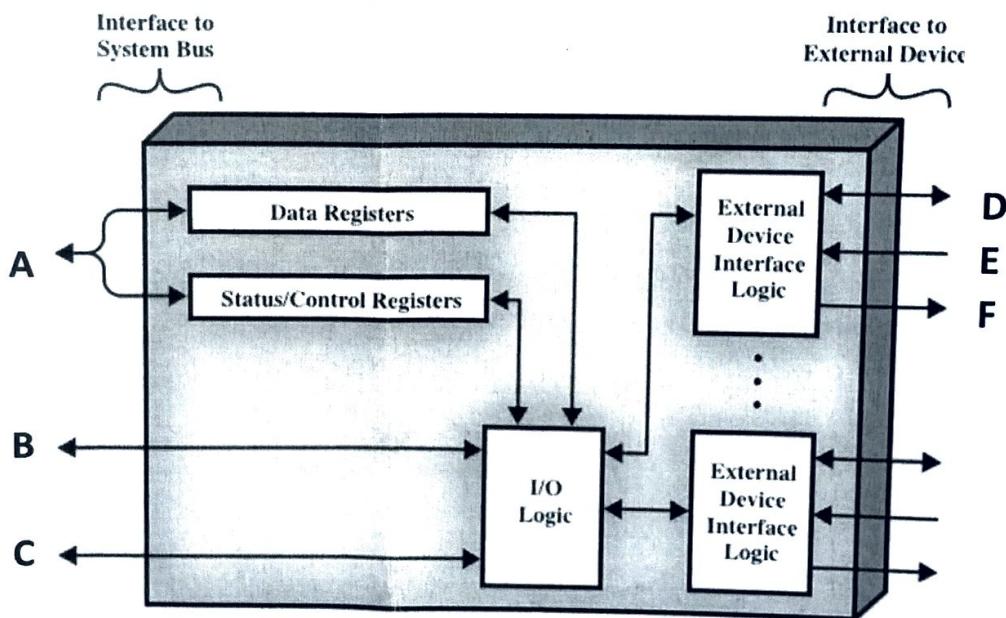


## Question 2

1. Give 3 physical characteristics that differentiate various types of magnetic disks as well as their sub parameters. [6 marks]
2. State and describe four types of optical disk products [4 marks]
3. How is redundancy achieved in a RAID system? [2 marks]

## Question 3

1. List three broad classifications of external, or peripheral, devices. [3 marks]
2. List three ways a processor can use to determine which device issued the interrupt, when a device interrupt occurs? [3 marks]
3. Below is a block diagram of an I/O module, label the lines marked A - F [6 marks]



4. Describe in detail the 3 ways of performing I/O, you may use diagrams if necessary [15 marks]

- END -

daisy chain  
bus

CD  
CD-R  
CD-RW  
DVD  
DVD-R  
DVD-RW

DURATION: 1 HOUR

33.5  
45

NAME: CHANDA MULENGA

Comp #: 14056526

SECTION A - Answer all. True or False, circle your answer.

- 13
- T  1. The variety of computer products is exhibited only in cost.
  - T  2. Changes in computer technology are finally slowing down.
  - T F 3. The number of bits used to represent various data types is an example of an architectural attribute.
  - T  4. Interfaces between the computer and peripherals is an example of an organizational attribute.
  - T F 5. A particular architecture may span many years and encompass a number of different computer models, its organization changing with changing technology.
  - T  6. A microcomputer architecture and organization relationship is not very close.
  - T  7. Changes in technology not only influence organization but also result in the introduction of more powerful and more complex architectures.
  - T F 8. The hierarchical nature of complex systems is essential to both their design and their description.
  - T F 9. A computer must be able to process, store, move, and control data.
  - T  10. The world's first general-purpose electronic digital computer was designed and constructed at The Ohio State University.
  - T F 11. The IAS is the prototype of all subsequent general-purpose computers.

- T  F 12. A vacuum tube is a solid-state device made from silicon.

T  F 13. Computers are classified into generations based on the fundamental hardware technology employed.

T  F 14. A wafer is made of silicon and is broken up into chips which consists of many gates and/or memory cells plus a number of input and output attachment points.

T  F 15. Designers wrestle with the challenge of balancing processor performance with that of main memory and other computer components.

**SECTION B – Answer all. Circle your answer.**

14 16. It is a(n) \_\_\_\_\_ issue whether the multiply instruction will be implemented by a special multiply unit or by a mechanism that makes repeated use of the add unit of the system.

- A. architectural
  - B. memory
  - C. mechanical
  - D. organizational

17. A \_\_\_\_\_ system is a set of interrelated subsystems.

- A. secondary      B. hierarchical  
C. complex      D. functional

18. An I/O device is referred to as a \_\_\_\_\_.



19. When data are moved over longer distances, to or from a remote device, the process is known as \_\_\_\_\_.

20. The \_\_\_\_\_ stores data.

- A. system bus
- B. I/O
- C. main memory
- D. control unit

21. The \_\_\_\_\_ moves data between the computer and its external environment.

- A. data transport
- B. I/O
- C. register
- D. CPU interconnection

22. \_\_\_\_\_ provide storage internal to the CPU.

- A. Control units
- B. ALUs
- C. Main memory
- D. Registers

23. The \_\_\_\_\_ was the world's first general-purpose electronic digital computer.

- A. UNIVAC
- B. MARK IV
- C. ENIAC
- D. Hollerith's Counting Machine

24. The \_\_\_\_\_ interprets the instructions in memory and causes them to be executed.

- A. main memory
- B. control unit
- C. I/O
- D. arithmetic and logic unit

25. The \_\_\_\_\_ contains the 8-bit opcode instruction being executed.

- A. memory buffer register
- B. instruction buffer register
- C. instruction register
- D. memory address register

26. During the \_\_\_\_\_ the opcode of the next instruction is loaded into the IR and the address portion is loaded into the MAR.

- A. execute cycle
- B. fetch cycle
- C. instruction cycle
- D. clock cycle

27. The \_\_\_\_\_ defines the third generation of computers.

- A. integrated circuit
- B. vacuum tube
- C. transistor
- D. VLSI

28. The use of multiple processors on the same chip is referred to as \_\_\_\_\_ and provides the potential to increase performance without increasing the clock rate.

- A. multicore
- B. GPU
- C. data channels
- D. MPC

29. The \_\_\_\_\_ measures the ability of a computer to complete a single task.

- A. clock speed
- B. speed metric
- C. execute cycle
- D. cycle time

30. ARM processors are designed to meet the needs of \_\_\_\_\_.

- A. embedded real-time systems
- B. application platforms
- C. secure applications
- D. all of the above

### SECTION C - Answer all. 6 1/2

Comp 15

1. Architecture refers to those attributes of a system visible to a programmer.
2. Control signals, interfaces between the computer and peripherals, and the memory technology used are all examples of organizational attributes.
3. The IBM architecture is the architecture of IBM's mainframe product line.
4. Structure is the way in which the components are interrelated.
5. Relation is the operation of each individual component as part of the structure.

6. A common example of system interconnection is by means of a bus consisting of a number of conducting wires to which all the other components attach
7. The major structural components of the CPU are: control unit, register, CPU interconnection, and Arithmetic and Logic Unit (ALU)
8. A CPU control unit operates by executing microinstructions that define the functionality of the control unit.
9. The first publication of the idea of the stored-program concept was in a proposal by John von Neumann for a new computer known as the ENIAC
10. A chip is an independent I/O module with its own processor and instruction set.
11. The RISC architecture is used in a wide variety of embedded systems and is one of the most powerful and best-designed RISC-based systems on the market.
12. The term embedded system refers to the use of electronics and software within a product, designed to perform a dedicated function, as opposed to a general-purpose computer such as a laptop or desktop system.
13. ARM chips are the processors in Apple's iPod and iPhone devices.
14. A processing suite is a collection of programs, defined in a high-level language, that together attempt to provide a representative test of a computer in a particular application or system programming area.
15. ? law deals with the potential speedup of a program using multiple processors compared to a single processor.