NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF COMPUTING AND INFORMATICS
DEPARTMENT OF COMPUTER SCIENCE

QUALIFICATION: BACHELOR OF COMPUTER SCIENCE, BACHELOR OF COMPUTER IN CYBER SECURITY & BACHELOR OF INFORMATICS	
QUALIFICATION CODE: 07BACS, 07BCCS & 07BAIF	**LEVEL:** 5
COURSE: COMPUTER ORGANISATION AND ARCHITECTURE	**COURSE CODE:** COA511S
DATE: JANUARY 2024	**PAPER:** THEORY
DURATION: 2H00	**MARKS:** 100

SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATION QUESTION PAPER	
EXAMINER(S)	MR. JULIUS SILAA MS. JOVITA MATEUS MS. VICTORIA SHAKELA MS. HELENA HAINANA MR. THOMAS SHOMWELE
MODERATOR:	MR. SEBASTIAN MUKUMBIRA

THIS QUESTION PAPER CONSISTS OF 5 PAGES
(Excluding this front page)

INSTRUCTIONS

1. Answer ALL the questions on the answer scripts.
2. Write clearly and neatly.
3. Number the answers clearly.

PERMISSIBLE MATERIALS

1. Calculator.

SECTION A [15 MARKS]: Each Question Weighs 1 Mark.

Indicate whether each of the following statements is True or False.

1 The raw speed of the microprocessor will not achieve its potential unless it is fed a constant stream of work to do in the form of computer instructions [True]/False]

2. Pipelining is a means of introducing parallelism into the essentially sequential nature of Machine-instruction program [True/False]

3. RISC processors are more responsive to interrupts because interrupts are checked between rather elementary operations [True/False]

4. Machine parallelism exists when instructions in a sequence are independent and thus can be executed in parallel by overlapping [True/False]

1. Organizational attributes include hardware details transparent to the programmer. [True/False]

2. The Instruction Set Architecture (ISA) defines the machine language instructions that a computer can follow. [True/False]

7. Cache memory is a much faster memory than the register file. [True/False]

8. Overflow can only occur if there is a carry. [True/False]

9. Interrupt is one of the five states for a process. [True/False]

10 Memory swapping is a situation where none of the processes in memory are in the ready state. [True/False]

11 A sequence of hexadecimal digits can be thought of as representing an integer in base 2. [True/False]

12. The instruction set is the programmer's means of controlling the processor. [True/False]

13. Memory references are faster than register references. [True/False]

14. The Kernel is a special type of programming language used to provide instructions to the monitor. [True/False]

15. The speed of a processor is dictated by the pulse frequency produced by the clock, measured in cycles per second, or Hertz (Hz). [True/False]

SECTION B [15 MARKS]: Each Question Weighs 1 Mark.

Choose the correct answer for each of the following:

1. The _____ measures the ability of a computer to complete a single task.

   A. clock speed B. Speed metric

   C. execute cycle D. Cycle time

2. The most fundamental type of machine instruction is the _____ instruction.

   A. conversion B. data transfer

   C. arithmetic D. logical

3. For _____, the address field references a main memory address and the Referenced register contains a positive displacement from that address.

   A. indexing B. base-register addressing

   C. relative addressing D. all of the them

4. The _____ determines the opcode and the operand specifiers.

   A. decode instruction B. fetch operands

   C. calculate operands D. execute instruction

5. The situation where the second instruction needs data produced by the first instruction to execute is referred to as _____.

   A. True data dependency B. Output dependency

   C. Procedural dependency D. Antidependency

6. The _____ exists in one of two states and, in the absence of input, remains in that state.

   A. assert B. complex PLD
   C. decoder D. flip-flop

7. _____ are used in digital circuits to control signal and data routing.

   A. multiplexers B. program counters
   C. flip-flops D. gates

8. The _____ specifies the operation to be performed.

   A. source operand reference B. opcode

   C. next instruction reference D. processor register

9. All instructions in the ARM architecture are _____ bits long and follow a regular format.

A. 8 B. 16
C. 32 D. 64

10.The _____ controls the movement of data and instructions into and out of the processor.

A. control unit B. ALU
C. shifter D. branch

11.The _____ contains the address of an instruction to be fetched.

A. instruction register B. memory address register
C. memory buffer register D. program counter

12._____ registers may be used only to hold data and cannot be employed in the calculation of an operand address.

A. General purpose B. Data
C. Address D. Condition code

13. A _____ is a dispatch able unit of work within a process that includes a processor context and its own data area for a stack.

A. Process B. Process switch
C. Thread D. Thread switch

14. A _____ architecture is one that makes use of more, and more fine-grained pipeline stages.

A. parallel B. superpipe lined
C. superscalar D. hybrid

15. Which of the following interrelated factors go into determining the use of the addressing bits?

A. number of operands B. number of register sets

C. address range D. all of the above

SECTION C [70 MARKS]: Comprehension questions.

Question 1

a) A Tesla smartphone has 16GB of RAM. The memory in this phone is divided into several words each 1024 bytes. How many bits are needed to address any single word in this memory? Show your work step by step (9 marks)

b) CPU is a vital computer resource and any good computing system should be design in such way to utilise CPU efficiently. Contrast programmed I/0 from I/O channel. Why the CPU usage by **I/O channel** CPU is more efficient than **Programmed I/O?** (6 marks)

Question 2

a) Explain your understanding of the following virtual memory concepts (4 marks)

i) paging

ii) demand paging

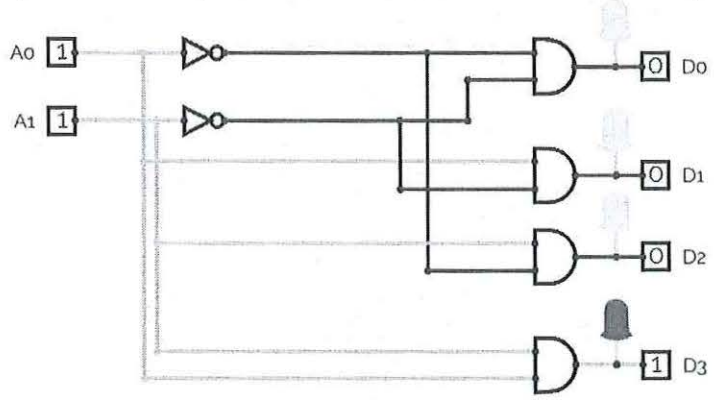
b)What is an ultimate importance of virtual memory management scheme? (4 marks)

Question 3

a) Name the following combinational circuit below (2 marks)

b) How does this combinational circuit work? (2 marks)

c) Provide one practical function of this circuit in a computer memory? (2 marks)



d) Write a note on Boolean algebra, the Boolean identities, Sum of Product and how these concepts combined can be applied to produce a digital circuit (8 marks)

Question 4

a) Each instruction must contain the information required by the processor for execution. Specify any four locations in a computer where source and result operands can be found (4 marks)

b) Provide an example of a low level computer instruction and briefly describe what this instruction must specify. (6 marks)

Question 5

c) The term addressing modes refers to the way in which the operand of an instruction is calculated or specified by using register information or information contained within the instruction or elsewhere. Provide an example of

d) the simplest form of addressing mode where the required data(operand) is present in the instruction itself (3 marks)

e) register Addressing Mode (3 marks)

f) relative addressing mode (6 marks)

Question 6

a) CPU executes predefined operations called instructions. For example by opening a WhatsApp messenger application on your mobile phone several things happen for you to be able to interact with this application.

Discuss the various stages of instruction processing (6 marks)

b) Program Status Word (PSW) is a register or set of registers that contain various process status information. List and briefly describe any 5 Common status flags (5 marks)

*******END OF PAPER*******