



ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Advanced Level

COMPUTER SCIENCE
PAPER 1

6023/1

NOVEMBER 2018 SESSION

3 hours

Additional materials:
Answer paper

TIME 3 hours

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces provided on the answer paper/answer booklet.

Answer **all** questions.

Write your answers on the separate answer paper provided.

If you use more than one sheet of paper, fasten the sheets together.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

You are reminded of the need for good English and clear presentation in your answers.

This question paper consists of 6 printed pages and 2 blank pages.

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[Turn over]

they operate in 2 psbl states

- 1 (a) Explain why computers use binary numbers. [1]
- (b) Express the denary number 78 as; 01001110
- (i) a binary number stored in an 8 bit byte, [2]
- (ii) a hexadecimal number, $4E$ [2]
- (iii) a number stored in Binary Coded Decimal (BCD). $0111\ 1000$ [2]

2 A computer stores numbers in Floating Point Form, using 8 bits for the mantissa and 8 bits for the exponent. Both the mantissa and the exponent are stored in two's complement form.

- (a) Explain the effect of this on the
- (i) range — is decreased because power of 2 w/ the mantissa is multiplying by is decrease [2]
- (ii) accuracy — Increased more digits are represented after the binary point [2]
- of the numbers that can be stored if the number of bits in the exponent is reduced.
- (b) Calculate the denary number which would have $01000000\ 00000010$ as its binary, floating point representation in this computer. $0.10000000 \times 2^2 = 10.000000 = 2.0$ [2]

- (c) Explain why it is **not** possible to represent zero as a normalised floating point number. — a normalised value must have the 1st two bits different [2]
- we must represent -1 or

- 3 (a) Draw the OSI model. [7]

- (b) Explain each layer of the OSI model. [7]

interface to the user — All People seem to need data processing
http, FTP

starts & terminates session
data transfer
delivers packets
formats, encodes & decodes data

ANSWER

Describe how each of the following elements would be used in the OSI model:

- (a) switch
- (b) modem
- (c) bridge
- private the computer
- 6

- 5 (a) Explain how the width of the data bus and the system clock speed affect performance of a computer system. [3]

- (b) (i) Differentiate the Von Neumann and Harvard architecture. [2]

- (ii) Explain **three** buses used in the Von Neumann Model. [6]

determine # of bits that can be transferred.
number of bits determines the speed.
number of cycles the CPU executes

- 6 The next instruction to be carried out is LDA25, which loads the number 25 into the accumulator.
- (a) With reference to special registers in the processor illustrate the stages of the *fetch and execute cycle* when dealing with the instruction above. [6]
- (b) Explain what is meant by an *interrupt*. [1]
- (c) Determine the actions of the processor when an interrupt is detected after an instruction has been fetched. [2]

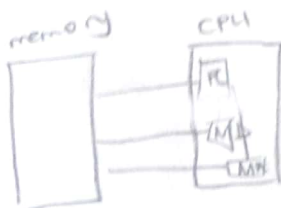
- 7 Schools in a district are connected to a WAN. It has been observed that files are being manipulated and there is violation of confidential information.
- Suggest measures that could be put in place to secure the WAN, giving reasons. [10]

- 8 A student is trying different ways of designing the process of entering data into an array.

He declares a variable called ArraySize and sets it to 3.

He declares an array Number [ArraySize]

He then writes the following pseudocode:



```

Element 1 ←
While element < ArraySize Do
  Input Number [Element]
  Element ← Element + 1
Endwhile
  
```

- (a) In the following table, trace the effects of entering 24, 57, 12.

ArraySize	Element	Element < ArraySize	number		
			(1)	(2)	(3)
3	24	true	24	2	
1	1	true	1		
	2	true			

[1]

(b) (i) State the type of error in the pseudocode.

(ii) The error can be corrected by changing one line.

[1]

Write the corrected line of the pseudocode.

[2]

(c) Re-write the code using the REPEAT... UNTIL Loop.

(d) The student wants to increase the size of the array to 500. This is too large to trace with the trace table.

Show how one would check that the logic of the pseudocode is correct for 500 iterations.

[3]

- 9 A database has been designed to store the data about sales persons and the products they have sold.

The following facts help to define the structure of the database.

- each salesperson works in a particular shop. ✓
- each salesperson has a unique first name ✓
- each shop has one or more salespersons ✓
- each product sold is manufactured by one company only
- each person can sell any of the products
- the number of products sold by each salesperson is recorded

The table ShopSales was the first attempt at designing the database.

Table: ShopSales

first name	shop	product name	number of products	manufacturer
Nick	TX	television set	3	SKC
		refrigerator	2	WP
		digital camera	6	HKC
Sean	BH	hair dryer	1	WG
		electric shaver	8	BG
John	TX	television set	2	SKC
		mobile phone	8	ARC
		digital camera	4	HKC
		toaster	3	GK

9 (a) Explain why the table is not in First Normal Form (1NF). [1]

(b) The database design is changed to:

Sales Person (First Name, Shop)

Sales Products (First Name, Product Name, Number of Products, Manufacturer)

Using data given in the first attempt table, **ShopSales**, show how the data is now stored in the revised table designs below.

(i) Table: SalesPerson

First Name	Shop

[1]

(ii) Table: SalesProduct

FirstName	ProductName	No. of Products	Manufacturer

[2]

(c) (i) Suggest a primary key for the tables in (b) giving a reason. [2]

(ii) Explain why the **SalesProduct** table is not in Second Normal Form (2NF) [2]

(iii) Write the table definitions to give the database in (2NF). [2]

Data Redu

2NF

10 A software company is interested in the project a student developed at Advanced Level and they are proposing commercialising it. They are worried about the authenticity of the project.

- (a) Suggest four points to look at to maintain product originality. [4]
- (b) There is a risk that the software company may steal the benefit. Discuss how to safeguard one's product. [6]