



ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Advanced Level

COMPUTER SCIENCE

PAPER 2 Practical

6023/2

3 hours

NOVEMBER 2024 SESSION

Additional materials:

- CD or flash disk
- Printing facility
- Bond Paper

INSTRUCTIONS TO CANDIDATES

This is a purely practical paper. All answers should be printed. Handwritten answers will **not** be marked.

Each answer sheet should include the following information in the header section:

- Candidate Name and Candidate Number
- Centre Name and Date
- Subject Code

When answering programming questions, indicate the language used.

All work should be backed up by a soft copy on a CD/flash disk and submitted together with answer sheets.

If a candidate prints on more than one sheet, fasten them together.

INFORMATION FOR CANDIDATES

This paper consists of **three** sections, **A**, **B** and **C**.

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

This question paper consists of 9 printed pages.

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[Turn over



Section A [20 marks]

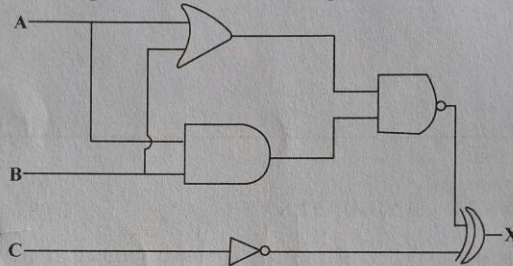
Answer any **one** question from this section.

1 Consider the logic statement:

$X = 1$ if ((A is NOT 1 OR B is 1) NOR C is 1)
NAND ((A is 1 AND C is 1) NOR B is 1)

- (a) Draw a logic circuit to represent the given logic statement. [7]
- (b) Construct the truth table for the above logic statement. [4]
- (c) Draw a diagram that shows how a processor, I/O devices and the memory unit are linked by connections known as buses. [9]

2 (a) Formulate the logic statement from the logic circuit given below. [5]



- (b) In a processor three instructions (X followed by Y, followed by Z) are processed using pipelining.

The following table shows the five stages that occur when instructions are fetched and executed.

Stage	Time interval								
	1	2	3	4	5	6	7	8	9
Fetch instruction	X								
Decode instruction									
Execute instruction									
Access operand in memory									
Write result to register									

[5]

The 'X' in the table indicates that instruction X has been fetched in time Interval 1.

Copy and complete the table to show the time interval in which each stage of each instruction (X, Y, Z) is carried out.

- (c) Produce a detailed flow chart of the fetch-decode execute cycle, showing all registers involved (including servicing of interrupt and a jump instruction).

[10]



Section B [50 marks]

Answer any **one** question from this section.

- 3 (a) Draw the table below and fill in with the most appropriate data type for the variable used in each statement.

STATEMENT	DATA TYPE
MyAverage $\leftarrow$ 13.5	
ProjectCompleted $\leftarrow$ True	
Subject $\leftarrow$ "Home Econo"	
MyMark $\leftarrow$ 270	
MyGrade $\leftarrow$ "B"	

[5]

- (b) Produce a program code that prompts the user to enter a year and check whether the year is a leap year or not.

[6]

- (c) Consider the following recursive algorithm:

Procedure Answer (b: integer)

```

    If (b = 0) OR (b = 1)
    THEN
        OUTPUT b
    ELSE
        CALL Answer (b Div2)
        Output (bMOD 2)
    ENDIF

```

ENDPROCEDURE

- (i) Dry run the procedure call Answer (19) by completing a trace table.

[9]

- (ii) What is the purpose of this algorithm?

[1]

- (d) A school has two types of students:

Daystudent
Nightstudent

- All students have their name and date of birth recorded.
- **Daystudents** have their address and telephone number recorded.
- A **Nightstudent** attends one or more subjects. A fee is charged for each subject. The number of subjects a **Nightstudent** attends is recorded along with the total fee and whether or not the fee has been paid.
- The school needs a program to process data about its students. The program will use an object-oriented programming language.



- (i) Draw a complete class diagram showing appropriate properties and methods. [10]
- (ii) Produce the program code for the class definition below: [3]
- superclass **Student**, [3]
 - subclass **Daystudent**.
- (e) A supermarket keeps details of its stock items in a file of records, called Stockfile.
- The record fields are the ProductCode, the Price and the NumberInStock.
- (i) Produce a program code to declare the record structure StockItem. [4]
- (ii) A stock report program uses a variable of type StockItem declared as follows:
- Declare ThisStockItem: StockItem
- The program reads each record in the file Stockfile in turn.
- The program outputs the fields ProductCode and NumberInStock For each record.
- Produce a pseudocode for this. [4]
- (f) Produce a program that generates 30 random numbers in the range 1 to 30 inclusive. [5]



- 4 (a) Draw a flow chart to represent the following problem:

- REPEAT the following UNTIL the number input is 0(zero)
- Input a number
- Check whether the number is negative or positive
- Increment positive number count if the number is positive
- Increment negative number count if the number is negative
- Output positive number count and negative number count [7]

- (b) A business uses a straight line depreciation function to calculate the value of its computer system assets over their useful life. Straight line depreciation assumes that an item will depreciate by a certain amount each year given by the formula $D = (P - S)/t$.

Where

D = Depreciation per year
 P = Purchase cost of the item
 S = Salvage value of the item (final value)
 t = Number of years the item will be in use

- (i) Produce a pseudocode that prints the value of the item each year after depreciation. [6]
- (ii) Using the pseudocode from part (a), trace the value of the item where:

Purchase cost = \$40 000
 Salvage value S = \$5 000 and
 The number of years = 4

NB: Use the trace table. [6]

- (c) The array X has been initialised as follows:

Index	0	1	2	3	4	5	6	7	8	9	10	11
X []	1	9	5	0	8	6	3	5	1	0	2	9

The subroutine A in the code below is going to be executed with parameter **b** set to 10 and parameter **c** set to 6.



	Function
1	Int A(int b, int c) {
2	Int d, e;
3	e = -1;
4	d = 0;
5	While (d < b) {
6	If (X(d) == c
7	e = d;
8	Endif
9	d + 1;
10	}
11	return (e);
12	}

- (i) Trace the call of the function A(10, 6) and show clearly the results of the call. [12]
- (ii) Rewrite Line 5 to line 9 using a for-Loop instead of a while-Loop. [6]
- (d) The rule $abc = a^3 + b^3 + c^3$ is of an Armstrong number for example:
 $371 = 3^3 + 7^3 + 1^3$.

Using the rule, produce a program code to find all Armstrong numbers in the range of 0 to 600. [8]

- (e) Below is a program code.

```

1 Dim StreamWriter As io. StreamWriter
2 Sub Main ( )
3 StreamWriter = New io. StreamWriter ("E:/Results.text")
4 StreamWriter.WriteLine ("Results are ready")
5 StreamWriter.WriteLine ("From the Advanced Level")

6 StreamWriter.Close ( )

7 End Sub
8 End Module

```

Write the meaning of each statement from line number 1 to Line number 6.

[5]



Section C [30 marks]

Answer any **one** question from this section.

- 5 (a) Study the following staff table for a Real Estate Agent.

Property ID	Address	IN Date	InTime	Comments	Staff-ID	Name
PG 16	Gweru	22/04/04	13:00	Replace carpet	SG14	David
		24/10/04	14:00	Good Condition	SG37	Anne
PG14	Kwekwe	18/10/05	10:00	Need repair	SG37	Anne
		22/04/04	09:00	Good condition	SG14	David
		1/10/04	12:00	No water	SG14	David

- (i) Normalise the above table to its First Normal and Second Normal form. [15]
- (ii) State **two** advantages of database normalisation. [2]
- (iii) Give the SQL command that can produce the staff table above using Staff ID as your primary key. [7]
- (b) Draw a well labelled diagram of the three level architecture of a Database Management System (DBMS). [6]
- 6 (a) Draw ERD showing the relationship between each of the following entities:
- (i) Country and Continent
- (ii) Hospital and Ward
- (iii) Person and Passport Number
- (iv) Book and Author
- (v) Country and President

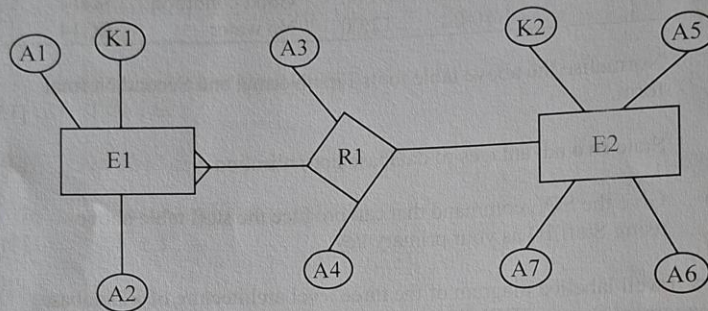
[5]



- (b) Muchaneta has a large DVD collection. Her friends like to borrow her DVD's and she needs a way to keep track of who has what. She maintains a list of friends identified by unique FIDs (friend identifiers) and a list of DVDs, identified by DVDIDs (DVD identifiers). Each friend has a name, telephone number and address. Each DVD has a star actor's name, and title. Muchaneta would enter the date borrowed and date returned respectively during borrowing and returning processes.

A friend can borrow a maximum of 3 DVDs at a time.

Below is an ERD for the above scenario.



Give appropriate names for the following:

- K1
- K2
- A1
- A2
- A3
- A4
- A5
- A6
- A7
- E1
- E2
- R1

[12]



- (c) Mzilikazi High School has candidates who sit for several examinations. Each candidate has a StudentNo, Name, phone and email address. Each examination has an ExamNo and subject.

The school keeps a record card, one for each examination where information about the examination is recorded. On the record card there is a RecordNo, subject, name and score.

Draw a normalised ERD for the above scenario, indicating the primary key for each entity by underlining it. Clearly show the relationship cardinalities.

[13]

