

CHINIOT ISLAMIA COLLEGE
Computer Science (2210) - Paper 2
1st Quarterly Test

Computer Science - O Levels - Grade O-II

Total Marks: 50 **Name:** _____ **Section:** _____

INSTRUCTIONS • Answer all questions. • Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs. • Write your name, centre number and candidate number in the boxes at the top of the page. • Write your answer to each question in the space provided. • Do not use an erasable pen or correction fluid. • Do not write on any bar codes. • Calculators must not be used in this paper.

INFORMATION • The total mark for this paper is 50. • The number of marks for each question or part question is shown in brackets []. • No marks will be awarded for using brand names of software packages or hardware.

Q1 .

1.

A television subscription service has a new database table named `Contract` to store details of their subscribers' contracts. The table contains these fields:

- `ContractNumber` – the contract number, for example CT567
- `Months` – the length of the contract in months, for example 6
- `EndDate` – the date the contract finishes, for example 30 November 2024
- `News` – the news service, yes or no
- `Movie` – the movie service, yes or no
- `Sport` – the sports service, yes or no
- `Junior` – the children's service, yes or no.

(a) Identify the field that will be the most appropriate primary key for this table.

..... [1]

(b) Complete the table to identify the most appropriate data type for these fields in `Contract`

Field	Data type
<code>ContractNumber</code>	
<code>Months</code>	
<code>EndDate</code>	
<code>Sport</code>	

[2]

(c) Explain the purpose of these structured query language (SQL) statements.

Statement 1: `SELECT SUM (Months) FROM Contract;`

Statement 2: `SELECT COUNT (News) FROM Contract WHERE News;`

Statement 1

.....

.....

Statement 2

.....

.....

[3]

2.

A database table called `SoftDrinks` stores details of the soft drinks sold by a small shop.

Field	Example data
Name	Cola
Supplier	Cambridge Beverages
Container	Can
SizeCl	330
NumberInStock	30
ReorderLevel	15
Reordered	Yes

- (a) State whether any of the given fields would be suitable as a primary key and give a reason for your answer.

.....
 [1]

- (b) Complete the structured query language (SQL) statement to return the number of cans the shop has in stock.

SELECT (.....)
 FROM
 WHERE = ;
 [5]

3.

A music streaming service has a new database table named `Songs` to store details of songs available for streaming. The table contains the fields:

- `SongNumber` – the catalogue number, for example AG123
- `Title` – the title of the song
- `Author` – the name of the song writer(s)
- `Singer` – the name of the singer(s)
- `Genre` – the type of music, for example rock
- `Minutes` – the length of the song in minutes, for example 3.75
- `Recorded` – the date the song was recorded.

(a) Identify the field that will be the most appropriate primary key for this table.

..... [1]

(b) Complete the table to identify the most appropriate data type for the fields in `Songs`

Field	Data type
<code>SongNumber</code>	
<code>Title</code>	
<code>Recorded</code>	
<code>Minutes</code>	

[2]

(c) Explain the purpose of the structured query language (SQL) statements.

`SUM (Minutes) FROM Songs WHERE Genre = "rock";`

`COUNT (Title) FROM Songs WHERE Genre = "rock";`

.....

 [3]

4.

A database table called `Hangar1` stores details of a collection of historic aircraft at a museum.

ID	Make	Model	Year	Engines	Airworthy
JM1	Hawker Siddeley	Nimrod	1966	4	Y
JM2	Douglas	DC-10	1970	3	Y
JM3	Aérospatiale-BAC	Concorde	1973	4	N
PB1	De Havilland	DH-9	1918	1	Y
PB2	Hawker	Fury	1935	1	Y
PB3	Hawker	Nimrod	1934	1	Y
PM1	Fieseler	Storch	1942	1	N
PM2	Hawker	Hurricane	1942	1	Y
PM3	Supermarine	Spitfire	1942	1	N
PM4	Douglas	C-47 Dakota	1942	2	N
PS1	Boeing	314 Clipper	1936	4	N

- (a) State the number of fields and records in the database table.

Fields

Records

[2]

- (b) Give the output that would be produced by the structured query language (SQL) statement:

```
SELECT Model, Year, Engines
FROM Hangar1
WHERE Engines > 1
ORDER BY Year;
```

[illegible]

[4]

5.

A model shop wants to set up a database to help with stock control of the model figures available for sale. The shop wants to store this information about the model figures:

Field 1 – catalogue number, for example MD1234

Field 2 – description, for example 'small white dog'

Field 3 – number in stock, for example 5

Field 4 – the price of each model, for example 7.40

Field 5 – if the model has already been painted, yes or no.

(a) The shop needs **five** fields for each record.

Give a suitable name and data type for each field.

Field 1 name

Data type

Field 2 name

Data type

Field 3 name

Data type

Field 4 name

Data type

Field 5 name

Data type

[5]

(b) (i) Give the name of the field that should be used for the primary key.

..... [1]

Q2 .

1.

There are **three** descriptions of logic gates. Each logic gate has two inputs **A** and **B** with one output **X**.

Identify each logic gate.

Complete a truth table for each logic gate.

(a) The only time the output is 1 is when both inputs are 1.

Logic gate

Complete the truth table for this description.

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]

(b) The output is 1 when both inputs are different.

Logic gate

Complete the truth table for this description.

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]

2. Consider the logic expression:

$$X = (\text{NOT } P \text{ OR } Q) \text{ NAND } (Q \text{ XOR } R)$$

(a) Draw a logic circuit for this logic expression.

Each logic gate must have a maximum of **two** inputs.

Do **not** simplify the logic expression.



(b) Complete the truth table for the given logic expression.

P	Q	R	Working space	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

3.

A motor driving a water pump has a safety system which uses three inputs to a logic circuit. A certain combination of conditions results in an output, X, from the logic circuit being equal to 1. When the value of X = 1 then the motor and pump are shut down. The following table shows which parameters are being monitored and form the three inputs to the logic circuit.

Parameter description	Parameter	Binary value	Description of condition
motor speed	S	0	motor speed $\leq$ 2000 rpm
		1	motor speed $>$ 2000 rpm
bearing temperature	T	0	bearing temperature $\leq$ 90°C
		1	bearing temperature $>$ 90°C
water velocity	V	0	water velocity $\leq$ 5 m/s
		1	wind velocity $>$ 5 m/s

The output, X, will have a value of 1 if any of the following combination of conditions occur:

- » **either** motor speed $>$ 2000 rpm and bearing temperature $>$ 90°C
- » **or** motor speed $\leq$ 2000 rpm and water velocity $\leq$ 5 m/s
- » **or** bearing temperature $>$ 90°C and water velocity $\leq$ 5 m/s
- a** Design a logic circuit for the above scenario.
- b** Complete a truth table for the above scenario.

4.

Produce the logic circuit and complete a truth table to represent the following scenario.

A power station has a safety system controlled by a logic circuit. Three inputs to the logic circuit determine whether the output, S, is 1. When S = 1 the power station shuts down.

The following table describes the conditions being monitored.

Parameter description	Parameter	Binary value	Description of condition
gas temperature	G	0	gas temperature $\leq$ 160°C
		1	gas temperature $>$ 160°C
reactor pressure	R	0	reactor pressure $\leq$ 10 bar
		1	reactor pressure $>$ 10 bar
water temperature	W	0	water temperature $\leq$ 120°C
		1	water temperature $>$ 120°C

Output, S, will generate a value of 1, if:

- either gas temperature $>$ 160°C AND water temperature $\leq$ 120°C
- or gas temperature $\leq$ 160°C AND reactor pressure $>$ 10 bar
- or water temperature $>$ 120°C AND reactor pressure $>$ 10 bar

5.

A wind turbine has a safety system which uses three inputs to a logic circuit. A certain combination of conditions results in an output, X, from the logic circuit being equal to 1. When the value of $X = 1$ then the wind turbine is shut down.

The following table shows which parameters are being monitored and form the three inputs to the logic circuit.

▼ Table 10.20

parameter description	parameter	binary value	description of condition
turbine speed	S	0	turbine speed ≤ 1000 rpm
		1	turbine speed > 1000 rpm
bearing temperature	T	0	bearing temperature $\leq 80^{\circ}\text{C}$
		1	bearing temperature $> 80^{\circ}\text{C}$
wind velocity	W	0	wind velocity ≤ 120 kph
		1	wind velocity > 120 kph

The output, X, will have a value of 1 if any of the following combination of conditions occur:

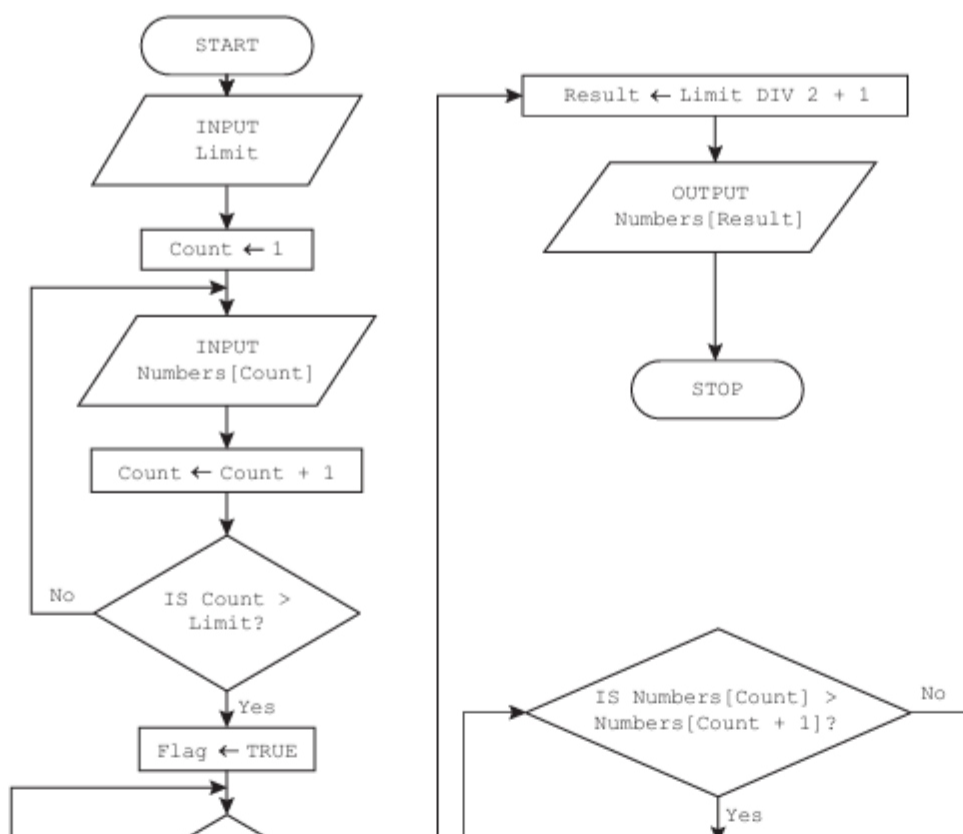
- Either** turbine speed ≤ 1000 rpm and bearing temperature $> 80^{\circ}\text{C}$
Or turbine speed > 1000 rpm and wind velocity > 120 kph
Or bearing temperature $\leq 80^{\circ}\text{C}$ and wind velocity > 120 kph

Design the logic circuit and complete the truth table to produce a value of $X = 1$ when either of the three conditions above occur.

Q3 .

1.

6 The flowchart represents an algorithm.



[illegible]

2.

This pseudocode algorithm is intended to allow, at random, between 1 and 20 values to be entered and totalled. The total and average of the entered values are output at the end of the algorithm.

```

01 DECLARE Loop : STRING
02 DECLARE Limit : INTEGER
03 DECLARE Value : REAL
04 DECLARE Total : REAL
05 Total ← 0
06 Limit ← ROUND(RANDOM() * 19,0) + 1
07 IF Loop ← 1 TO Limit
08     OUTPUT "Enter a number"
09     INPUT Loop
10     Total ← Total * Value
11 NEXT Loop
12 OUTPUT "The total of the numbers entered is ", Total
13 OUTPUT "The average of the numbers entered is ", Total / Limit

```

(a) Identify the line numbers of **four** errors in the pseudocode and suggest corrections.

Error 1 line number

Correction

.....

Error 2 line number

Correction

.....

Error 3 line number

Correction

.....

Error 4 line number

Correction

.....

[4]

3.

One stage of the program development life cycle is the analysis stage.

Identify and describe **two** other stages of the program development life cycle.

Stage

Description

.....

.....

.....

Stage

Description

.....

.....

.....

.....

[6]

4.

An algorithm has been written in pseudocode to check if a temperature is in a given range. The temperature values used in the algorithm are correct.

```
01 REPEAT
02     OUTPUT "Please enter temperature "
03     INPUT Temp
04     IF Temperature = 999
05         THEN
06             IF Temperature > 38.0
07                 THEN
08                     OUTPUT "Temperature too high"
09             ENDIF
10             IF Temperature < 35.0
11                 THEN
12                     OUTPUT "Temperature too low"
13             ENDIF
14             IF Temperature >= 35.0 OR Temperature <= 38.0
15                 THEN
16                     OUTPUT "Temperature normal"
17             ENDIF
18     ENDIF
19 WHILE Temperature = 999
```

- (a) Identify the line numbers of **four** errors in the pseudocode and suggest a correction for each error.

Error 1 line number

Correction

.....

Error 2 line number

Correction

.....

Error 3 line number

Correction

.....

Error 4 line number

Correction

.....

[4]

5.

State **three** different features of a high-level programming language that a programmer could use to make sure that their program will be easier to understand by another programmer. Give an example for each feature.

Feature 1

.....

Example

.....

Feature 2

.....

Example

.....

Feature 3

.....

Example

.....

[6]

6.

Complete the paragraph about databases. Use terms from the list. You may need to use a term more than once. Some of the terms in the list will **not** be used.

fields	comments	columns	constant	key
table	primary key	program	records	rows
scripts	database	validation	variable	

Database tables consist of and

Rows are

..... are fields.

Structured query language (SQL) are used to query data.

A uniquely identifies a record.

[6]

7.

Analysis is one stage in the program development life cycle.

(a) State **one** other stage in the program development life cycle.

..... [1]

(b) Describe the analysis stage of the program development life cycle.

.....
.....
.....
.....
.....
..... [3]

Outline **one** type of verification check that could be used when inputting data.

.....
.....
.....
..... [2]

8.

An algorithm has been written in pseudocode to allow some numbers to be input. All the positive numbers that are input are totalled and this total is output at the end.
An input of 0 stops the algorithm.

```
01 Exit ← 1
02 WHILE Exit <> 0 DO
03     INPUT Number
04     IF Number < 0
05         THEN
06             Total ← Total + Number
07         ELSE
08             IF Number = 0
09                 THEN
10                     Exit ← 1
11             ENDIF
12         ENDIF
13 ENDIF
14 OUTPUT "The total value of your numbers is ", Number
```

(a) Identify the **four** errors in the pseudocode and suggest a correction for each error.

Error 1

Correction

.....

Error 2

Correction

.....

Error 3

Correction

.....

Error 4

Correction

.....

[4]

9.

This pseudocode algorithm is intended to allow, at random, between 1 and 20 values to be entered and totalled. The total and average of the entered values are output at the end of the algorithm.

```

01 DECLARE Loop : STRING
02 DECLARE Limit : INTEGER
03 DECLARE Value : REAL
04 DECLARE Total : REAL
05 Total ← 0
06 Limit ← ROUND(RANDOM() * 19,0) + 1
07 IF Loop ← 1 TO Limit
08     OUTPUT "Enter a number"
09     INPUT Loop
10     Total ← Total * Value
11 NEXT Loop
12 OUTPUT "The total of the numbers entered is ", Total
13 OUTPUT "The average of the numbers entered is ", Total / Limit

```

(a) Identify the line numbers of **four** errors in the pseudocode and suggest corrections.

Error 1 line number

Correction

.....

Error 2 line number

Correction

.....

Error 3 line number

Correction

.....

Error 4 line number

Correction

.....

[4]

(b) Write the pseudocode statement that would output the average calculated in line 13 of the algorithm rounded to **one** decimal place.

.....

.....

.....

..... [2]

10.

Tick (✓) **one** box to complete this sentence.

A solution to a problem may be represented using pseudocode, flowcharts or

- | | | |
|---|---------------------|--------------------------|
| A | procedures. | ☐ |
| B | processes. | ☐ |
| C | structure diagrams. | ☐ |
| D | sub-systems. | ☐ |

[1]

Tick (✓) **one** box to complete this sentence.

A pseudocode example of a selection statement is

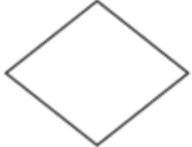
- | | | |
|---|------------------------------|--------------------------|
| A | CALL Sorting(Value1, Value2) | ☐ |
| B | DECLARE Count : INTEGER | ☐ |
| C | IF X = 7 THEN Y ← 21 ENDIF | ☐ |
| D | WHILE X <> -1 DO | ☐ |

[1]

Four flowchart symbols and five purposes are shown.

(a) Draw **one** line to link each flowchart symbol to its correct purpose.

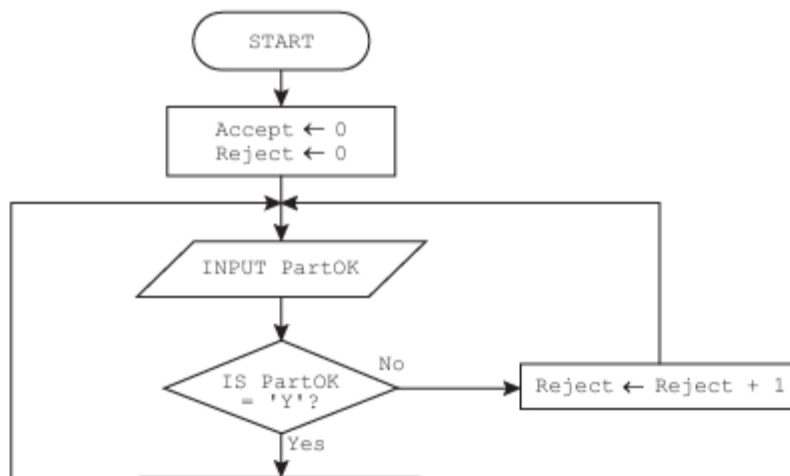
Not all purposes will be used.

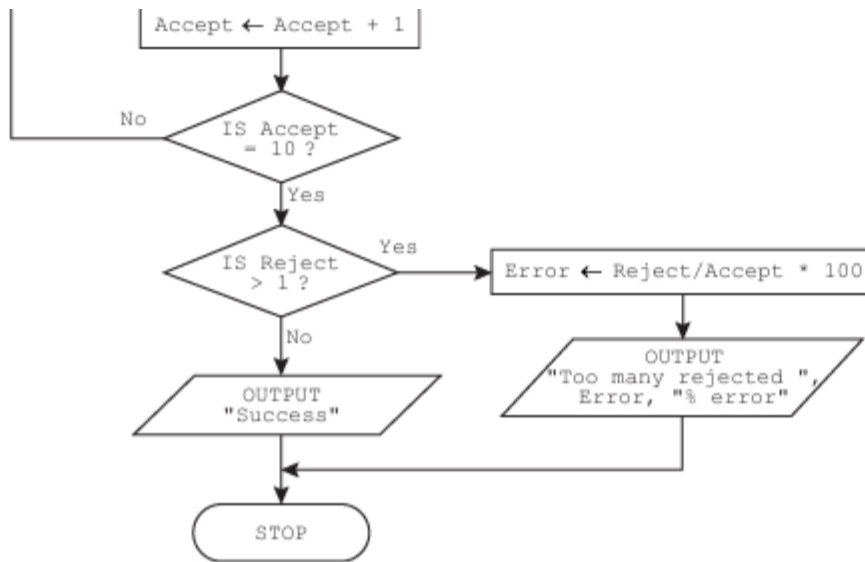
Flowchart symbol	Purpose
	☐ subroutine
	☐ process
	☐ flow
	☐ decision
	☐ terminator

[4]

11.

This is an algorithm to find if a batch of parts has been manufactured successfully.





Complete the trace table using this data:
Y, Y, Y, N, Y, Y, Y, Y, N, Y, Y, Y, Y

Accept	Reject	PartOK	Error	OUTPUT

[5]

(b) Describe the purpose of the algorithm.

.....

.....

.....

..... [2]

12.

A high-level programming language makes use of arithmetic, Boolean and logical operators.

State how each type of operator is used.

Give an example statement, in pseudocode, for each one.

Arithmetic

.....

Example

.....

Boolean

.....

Example

.....

Logical

.....

Example

.....

[6]