CHINIOT ISLAMIA PUBLIC SCHOOL AND COLLEGE

1ST QUARTERLY TEST

Computer Science (2210) - Paper 2 - Grade O-I

Name: _____	**Section:** _____	**Roll No:** _____

Duration: 2 Hours **Total Marks: 50**

General Instructions: Answer all questions. Use a black or dark blue pen. Write your name, centre number and candidate number in the boxes at the top of the page.

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.

1 (a) **Four** descriptions of stages in the program development life cycle are shown.

Draw **one** line to link each description to its most appropriate program development life cycle stage.

Not all program development life cycle stages will be used.

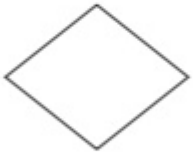
Program development life cycle description	**Program development life cycle stage**
develop an algorithm to solve the problem by using structure diagrams, flowcharts or pseudocode	analysis
detect and fix the errors in the program	coding
identify the problem and its requirements	design
write and implement the instructions to solve the problem	evaluation
	testing

[4]

2. **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]

3. 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]

4. A traffic signal system: If color = RED → Stop If color = YELLOW → Get Ready If color = GREEN → Go Else → Invalid input Write pseudocode.

5.

3 **Four** development life cycle stages and **five** descriptions are shown.

Draw **one** line from each stage to the most appropriate description.
Not all descriptions will be used.

Stage	Description
testing	identifying the problem and requirements
analysis	reviewing the final solution to suggest further developments
coding	making sure the program code works as expected
design	using structure diagrams, flowcharts and pseudocode to plan the solution
	using a programming language to create the solution

[4]

6.

Identify **three** of the component parts after a problem has been decomposed.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

7. A school menu system: 1 → Maths class 2 → Science class 3 → English class 4 → Computer class Otherwise → Invalid entry Write pseudocode with CASE OF.

8. Tick (✓) **one** box to identify which option is used to show the inputs and output of a Boolean expression.

A flowchart ☐

B trace table ☐

C truth table ☐

D variable ☐

[1]

Four operators and **three** types of operator are shown.

Draw **one or more** lines from each operator to its correct operator type.

Operator	Operator type
>=	Boolean
AND	Arithmetic
DIV	Logical
+	

[4]

9. **3** Identify **three** different ways that the design of a solution to a problem can be presented.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

10. A shop gives discount: Purchase ≥ Rs. 10,000 → 20% discount Purchase ≥ Rs. 5,000 → 10% discount Purchase ≥ Rs. 2,000 → 5% discount Else → No discount Write pseudocode

11. A school gives grades based on marks: Marks ≥ 80 → Grade A Marks ≥ 60 → Grade B Marks ≥ 40 → Grade C Else → Fail Write pseudocode using IF–ELSEIF–ELSE to determine the grade.

12. A calculator program asks user to choose operation: 1 → Add 2 → Subtract 3 → Multiply 4 → Divide Otherwise → Invalid Choice Write pseudocode using CASE OF.

13. State what is meant by the data types integer and real.
Give an example of each.

Integer .....

.....

Example .....

Real .....

.....

Example .....

[4]

14. 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]

15. A vending machine: 1 → Tea 2 → Coffee 3 → Juice 4 → Water Otherwise → Invalid selection Write pseudocode with CASE OF.

Q2 .

1. 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 <= 80°C
		1	bearing temperature > 80°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°C

Or turbine speed > 1000 rpm and wind velocity > 120 kph

Or bearing temperature <= 80°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.

2. Produce:

i a truth table

ii a logic circuit

from the following logic expression:

(A XOR B) OR ((B NOR C) AND B)

3. Show why X = (A AND NOT B) OR (NOT A AND B)
and
Y = (A OR B) AND (NOT (A AND B)) both represent the same logic gate.

4. Write down a logic expression for **each** of the following truth tables:

a

A	B	C	X
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0

b

A	B	C	X
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0

5. 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 <= 2000 rpm
		1	motor speed > 2000 rpm
bearing temperature	T	0	bearing temperature <= 90°C
		1	bearing temperature > 90°C
water velocity	V	0	water velocity <= 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 <= 2000 rpm and water velocity <= 5 m/s
- **or** bearing temperature > 90°C and water velocity <= 5 m/s

a Design a logic circuit for the above scenario.
b Complete a truth table for the above scenario.

6. Produce:

i a truth table
ii a logic circuit

from the following logic expression:

(NOT A AND B) AND (NOT B OR C)

7.

7.

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 <= 160°C
		1	gas temperature > 160°C
reactor pressure	R	0	reactor pressure <= 10 bar
		1	reactor pressure > 10 bar
water temperature	W	0	water temperature <= 120°C
		1	water temperature > 120°C

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

either gas temperature > 160°C AND water temperature <= 120°C

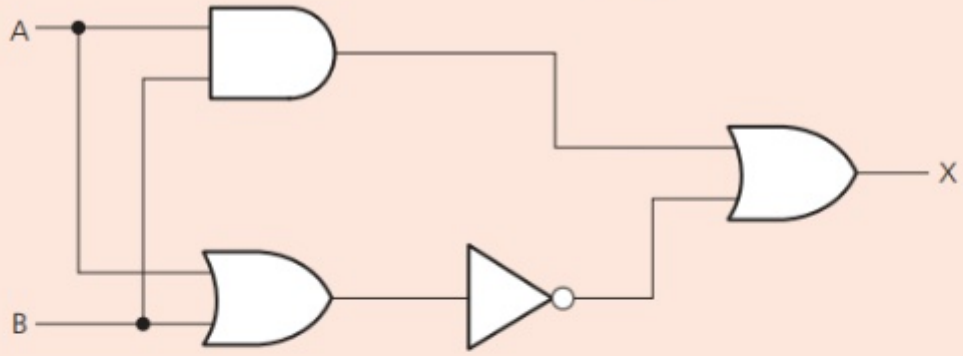
or gas temperature <= 160°C AND reactor pressure > 10 bar

or water temperature > 120°C AND reactor pressure > 10 bar

8

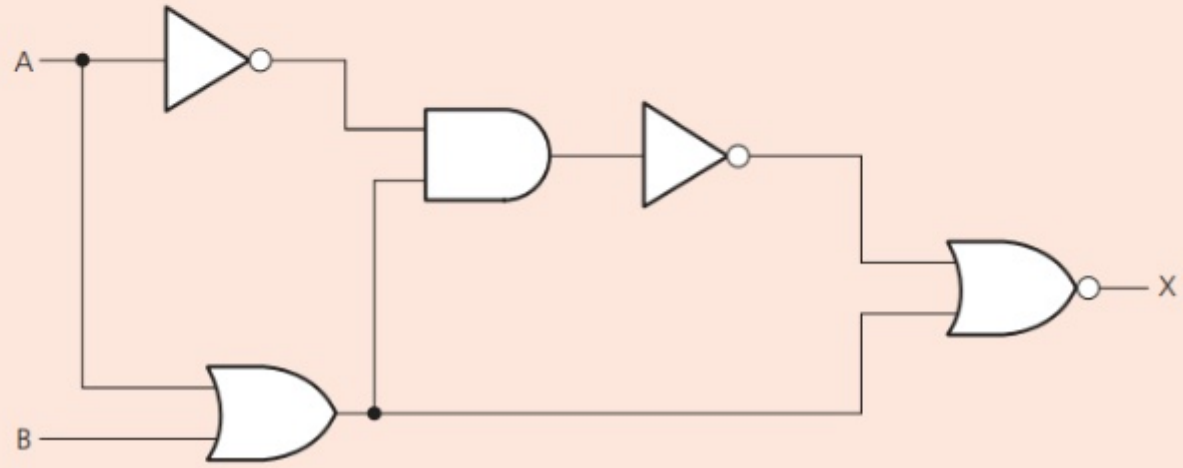
8. Produce truth tables from the following logic circuits:

a



▲ **Figure 10.14**

b



▲ **Figure 10.15**

9.

9. A car's engine management system uses three sensors A, B and C. The data from these sensors forms the input to a logic circuit. When the output (X) from the logic circuit is 1 a signal is sent to a warning light on the dash board of the car.

The following table describes the conditions being monitored.

Parameter description	Parameter	Binary value	Description of condition
exhaust temperature	E	0	exhaust temperature > 400°C
		1	exhaust temperature <= 400°C
oil pressure	P	0	oil pressure <= 10 bar
		1	oil pressure > 10 bar
water temperature	W	0	water temperature <= 110°C
		1	water temperature > 110°C

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

either exhaust temperature > 400°C AND oil pressure > 10 bar

or oil pressure <= 10 bar AND water temperature > 110 °C

or oil pressure > 10 bar AND water temperature > 110 °C

Produce:

i a truth table,

ii a logic expression and

iii a logic circuit

10

10.

A DVD recorder is protected by three sensors (S, T and P). The output from these sensors forms the inputs to a logic circuit. A certain combination of input values produces an output of 1 from the logic circuit. When this occurs a warning message is shown on the DVD display. 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
rotation speed	S	0	rotation speed >= 1000 rpm
		1	rotation speed < 1000 rpm
tilt angle	T	0	tilt angle >= 30°
		1	tilt angle < 30°
laser power	P	0	laser power < 150 mW
		1	laser power >= 150 mW

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

- either rotation speed >= 1000 rpm and tilt angle < 30°
- or rotation speed < 1000 rpm and laser power >= 150 mW
- or tilt angle >= 30° and laser power < 150 mW

a Write down a logic or Boolean expression for the above system.

b Draw a logic circuit to monitor the above system.

11.

a Write down a logic expression corresponding to the following truth table:

A	B	C	X
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0

b Show that the following logic expression produces the same output as your answer to part **a** above:

(NOT A AND NOT B) OR (A AND NOT B)

Q3 .

1

1. A logic circuit is to be built to control the opening of a safe used to store money. There are two keys, **A** and **B**, and a time switch **C**. The safe can only open if both keys are used and the time switch is off.

key **A**	not used	0
	used	1
key **B**	not used	0
	used	1
time switch **C**	switch off	0
	switch on	1
safe **X**	safe cannot open	0
	safe can open	1

(a) Write the logic expression for this problem.

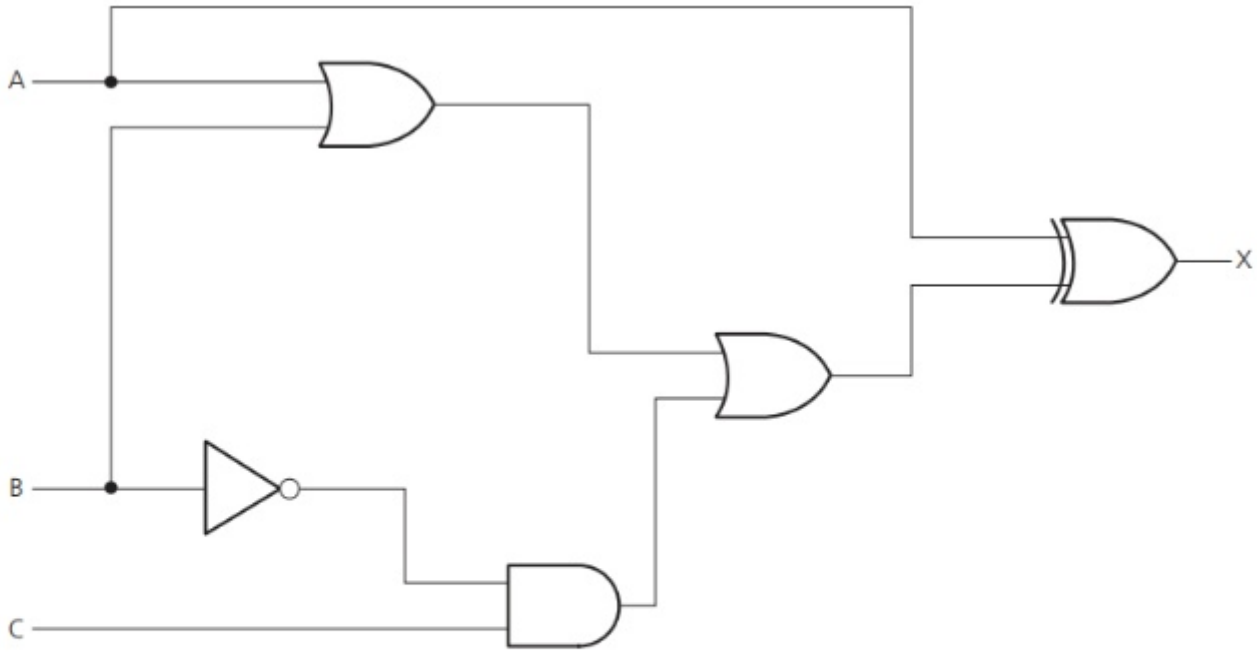
..... [3]

(b) Complete the truth table for this problem.

A	B	C	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		

2 c. Complete the truth table for the following logic circuit:

2. Complete the truth table for the following logic circuit.



[4]

3 Consider the logic expression:

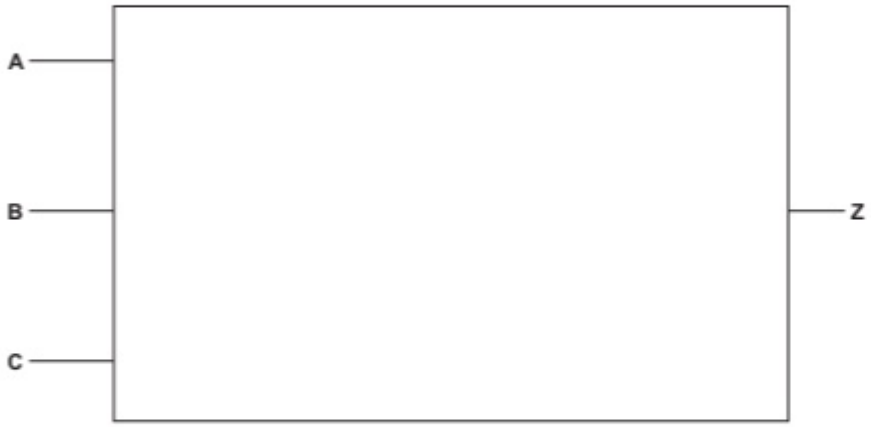
3. Consider the logic expression:

Z is 1 if (**A** = 1 AND **C** = NOT 1) AND (**B** = 1 NOR **C** = 1)

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

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

Do **not** simplify this logic expression.



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

A	B	C	Working space	Z
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

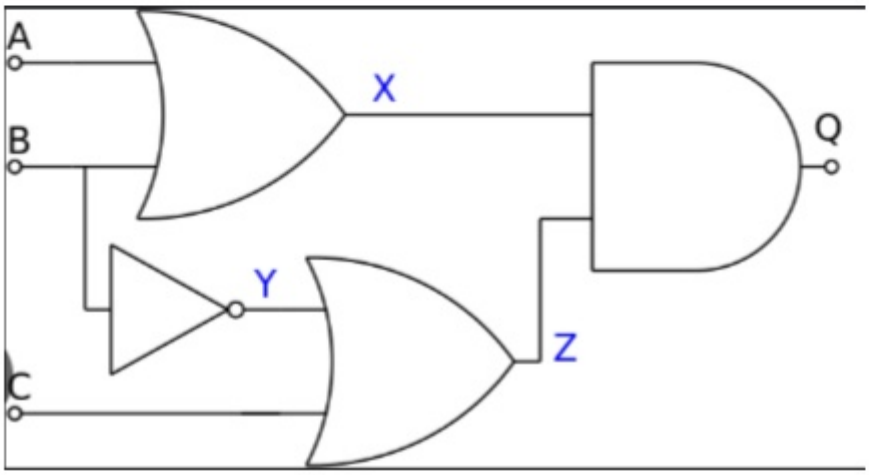
4. Create Logic Expression and Logic Circuit

A	B	C	Output
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

5. Create Logic Circuit and Logic Expression

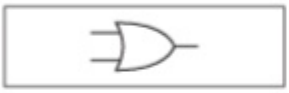
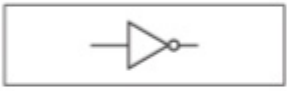
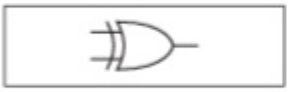
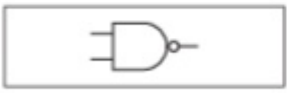
A	B	C	Y
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

6. Create Logic Expression and Truth Table



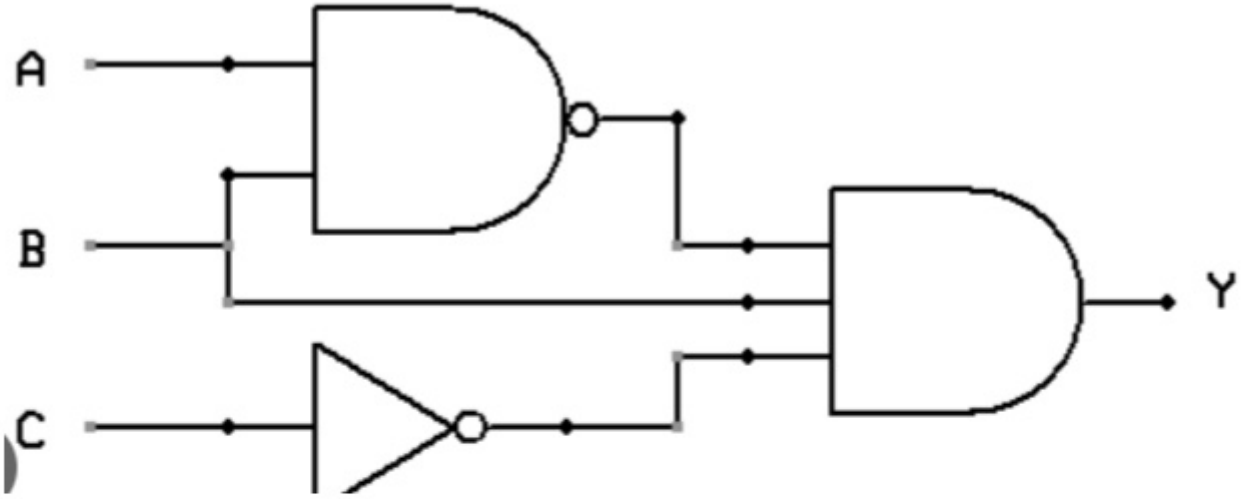
7. **Four** logic functions and **five** standard symbols for logic gates are shown.

Draw **one** line to link each logic function to its standard symbol. **Not** all standard symbols will be used.

Logic function	Standard symbol
AND	
XOR	
NAND	
OR	
	

[4]

8. Create Logic Expression and Truth Table



9. 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]

10. Consider the logic expression:

Consider the logic expression:

Z = (**A** NAND **B**) OR NOT (**B** XOR **C**)

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

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

Do **not** simplify this logic expression.

[4]

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

A	B	C	Working space	Z
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]