Industrial Computing 3
5650

GENERAL CERTIFICATE OF EDUCATION BOARD
Technical and Vocational Education Examination

JUNE 2026 **INTERMEDIATE LEVEL**

Specialty Name and Acronym	**All Industrial Specialties Except FDE, APOP & APIP**
Subject Title	**INDUSTRIAL COMPUTING**
Subject Code No.	**5650**
Paper No.	**3 (Group 1)**

Duration: Three Hours

INSTRUCTIONS TO CANDIDATES

1. Attempt all questions in the order given.
2. Respect all the instructions given in each exercise.
3. Data in the appendices or candidates folder should be used in the order given

Turn Over

Question 1: Spreadsheet

1. a) Open the Candidate folder provided and open the spreadsheet Sales.xlsx **(1 mark)**
   b) On the Invoice Worksheet use a Date Function in Cell B3 that will return the current date. **(2 marks)**
   c) Write out the Function as used in B3 Above _____ **(2 marks)**
2. a) In **cell F6** use a Formula to calculate the Amount of the first product based on Quantity and Unit Price. **(2 marks)**

   b) Copy apply the formula to get the results of the remaining products from Cell **F7 to F25**. **(1 mark)**
   c) Write down the formula in **Cell B10.** _____ **(2 marks)**
3. a) In **cell I6**, use the ***IF Function*** or related function to return **YES** if the Amount in **Cell F6** is greater than the Targeted Amount in cell G6; and **NO** if the value is less.**(4 marks)**
   Copy apply the formula to the remaining cells **I7 to I25** **(1 mark)**
   b) Write the function used in Cell I6 above. _____ **(2 marks)**
4. a) In **cell F28** use a suitable function that will return the number of paid invoices as indicated in the cell range G6 **to G25.** **(3 marks)**
   b) Write down the Function or formula used in **F28** above. _____ **(2 marks)**
5. a) In **cell F30** use a suitable function that will return the number of invoices whose amounts are above 1,000,000 in the cell range **F6 to F25** **(2 marks)**
   b) Write down the Function or formula used in **F30** above. **(2 marks)**
   c) Sort the data table in Ascending Order of Product Name. **(2 marks)**
6. Print a copy of the Worksheet and submit **(2 marks)**

(Total = 30 marks)

Question 2: Database

1. a) Open the Candidate folder provided and open the database file **Hilltop Construction.accdb** **(1 mark)**

   b) Open the **Workers** database and Identify which field is most suitable as the Primary Key. Switch to design mode and assign the Primary key you have identified. **(3 marks)**
   c) Write the name of the Primary Key field identified above._____ **(1 mark)**
   d) Indicate how many Fields and Records that are found on the Workers Database.

No of Fields	No of Records

(2 marks)

   e) Use suitable filtering options to extract workers who work either in the **Civil Engineering** or **Carpentry** departments.
   Sort the extracted Records in **ascending order**.
   Print a copy (Landscape) of the extracted records. **(4 marks)**

   f) Add the following Records to the **Workers** database.

Workers

EmpID	Last Name	First Name	Male?	Hire Date	Department	Division	Salary	Taxes	Total Deductions	Gross Pay	Net Pay
WI163AMS	Williams	Dumgya	Yes	16/04/2023	Civil Engineering	3	280000	8400	14000	295000	281000
IS72AIL	Ismail	Moussa	Yes	07/02/2013	Electricity	2	263000	7890	13150	273000	259850
ST124LAR	Stellar	Akong	No	12/02/2012	Electricity	4	260000	7800	13000	280000	267000

(3 marks)

2. a) Create a Query using the Workers Table or Database. Add the following fields only to your Query **(4 marks)**

Go on to the next page

EmpID	Last Name	First Name	Male?	Department	Division	Salary	Gross Pay

b) Use suitable criteria that will bring forward only workers whose **Gross Pay is more than or equivalent to 280,000** **(3 marks)**

c) Sort the Query in **ascending order** of Department and **Descending order** of **Gross Pay**. **(2 marks)**

d) **Run** the Query and Save it as **High Income**. **(3 marks)**

e) **Print** a copy of the query. **(1 mark)**

f) Write down the query criteria used in 2b above. _____ **(2 marks)**

(Total = 30 marks)

Question 3: Control of industrial processes

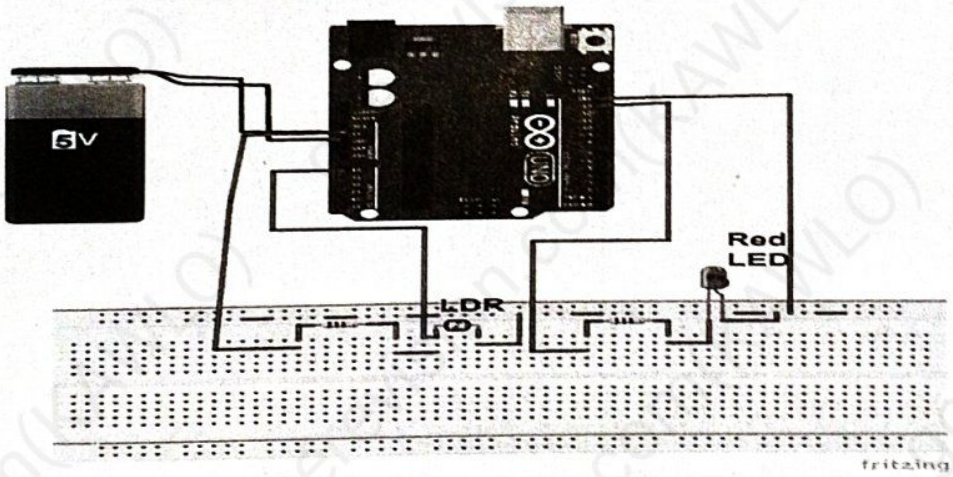
Most manufacturing plant do not have a system to monitor the change in temperature in the furnace. The system uses a temperature sensor to monitor the temperature of a chemical manufacturing plant and uses LEDs to indicate the state of the system.

I- OPERATING PRINCIPLE

The system operates as follows.

- At room temperature, 25^{0}C, the heater and the fan are OFF.
- When the temperature is above room temperature, the heater is turned off, the red LED and the fan are turned on.
- When the temperature drops to below room temperature, the fan is turned off, the yellow LED and the heater are turned on

II- CIRCUIT DIAGRAM OF THE SYSTEM



III- Work to be done

1. Develop the algorithm of the system. **(8 marks)**
2. Draw the flow chart. **(8 marks)**
3. Write the sketch required to control the system. **(8 marks)**
4. Transfer the sketch to the plane sheet of paper provided. **(2 marks)**
5. Type the sketch in the arduino IDE. **(4 marks)**
6. Verify the sketch and correct the errors.

7. Upload the error free c code to the arduino UNO kit with all the components connected to it(The external supervisor is expected to connect all the components to the arduino). **(4 marks)**
8. Power the automated control system from a 5V battery.
9. Take a dark cloth and cover the light dependent resistor. The red LED should come on. Remove the dark cloth from the light dependent resistor. The red LED should go off. If the system does not work correctly at the first trial, the candidate is given two more chances to make it work correctly. The candidate loses 5mks after each unsuccessful trial. If after three trials the circuit does not work, it is the duty of the examiners to make it work so that the candidate can continue with the rest of the examination. **(6 marks)**

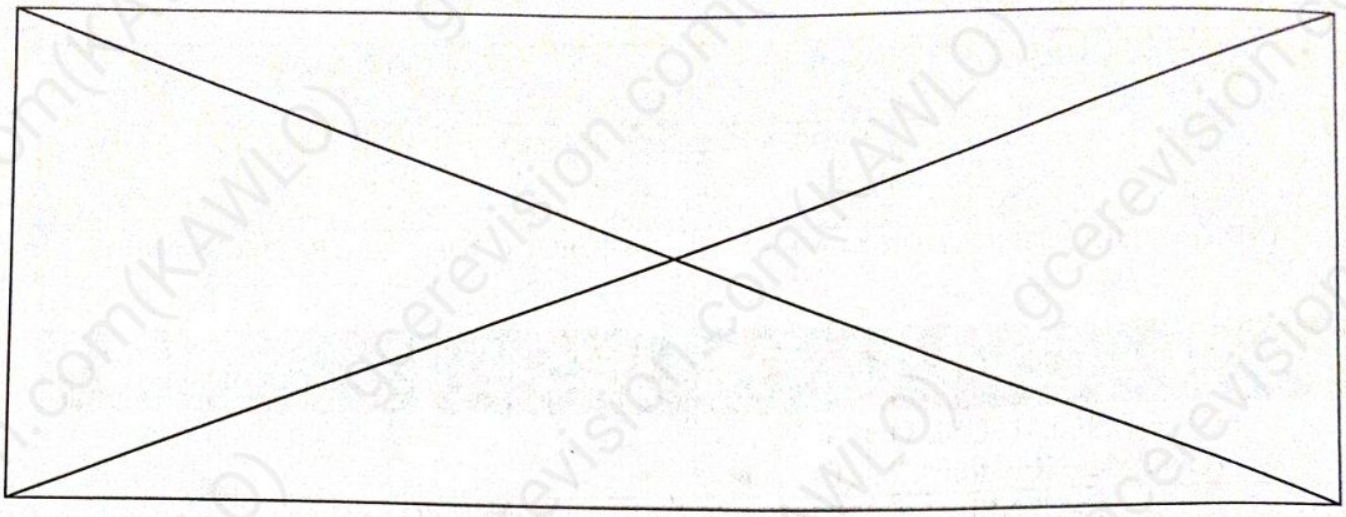
(Total = 40 marks)

REGISTRATION CENTRE NUMBER	CENTRE NAME	
CANDIDATE'S FULL NAMES		
CANDIDATE IDENTIFICATION NUMBER	SUBJECT CODE **5650**	PAPER NUMBER **3**
FOR OFFICIAL USE ONLY (Candidate Random Code) ▶		

GENERAL CERTIFICATE OF EDUCATION BOARD
Technical And Vocational Education Examination
INTERMEDIATE LEVEL

SUBJECT TITLE: **Industrial Computing**	SUBJECT CODE **5650**	PAPER NUMBER **3**
Specialty: All Industrial Specialties Except FDE, APOP & APIP	EXAMINATION DATE: **JUNE 2026**	

EVALUATION BOOKLET



Question 3: Control of industrial processes

1. Develop the algorithm of the system. **(8 marks)**

2. Draw the flow chart. **(8 marks)**

3. Write the sketch required to control the system. **(8 marks)**

EVALUATION SHEET

Exercise	Content	Duration	Marks Allocation	Marks Scored
SPREADSHEET	Open the Candidate folder provided and open the spreadsheet Sales.xlsx	1 hour	1	
	On the Invoice Worksheet use a Date Function in Cell B3 that will return the current date.		2	
	Write out the Function as used in B3 Above		2	
	In cell F6 use a Formula to calculate the Amount of the first product based on Quantity and Unit Price.		2	
	Copy apply the formula to get the results of the remaining products from Cell F7 to F25		1	
	Write down the formula in **Cell B10.**		2	
	In cell I6, use the IF Function or related function to return YES if the Amount in Cell F6 is greater than the Targeted Amount in cell G6; and NO if the value is less.		4	
	Copy apply the formula to the remaining cells I7 to I25		1	
	Write the function used in Cell I6 above		2	
	In **cell F28** use a suitable function that will return the number of paid invoices as indicated in the range G6 to G25.		3	
	Write down the Function or formula used in F28 above		2	
	In **cell F30** use a suitable function that will return the number of invoices whose amounts are above 1,000,000 in the cell range **F6 to F25**		2	
	Write down the Function or formula used in **F30** above.		2	
	Sort the data table in Ascending Order of Product Name and Print a copy of the Worksheet.		4	
	SUB TOTAL		30	
DATABASE	Open the Candidate folder provided and open the database file Hilltop Construction.accdb	1hour	1	
	Open the **Workers** database and Identify which field is most suitable as the Primary Key. Switch to design mode and assign the Primary key you have identified		3	
	Write the name of the Primary Key field identified above		2	
	Indicate how many Fields and Records that are found on the Workers Database		2	
	Use suitable filtering options to extract workers who work either in the Civil Engineering or Carpentry departments. Sort the extracted Records in ascending order. Print a copy (Landscape) of the extracted records.		4	
	Adding Records to the Workers database		3	
	Create a Query using the Workers Table or Database. Add the following fields only to your Query		4	
	Use suitable criteria that will bring forward only workers whose Gross Pay is more than or equivalent to 280,000		3	
	Sort the Query in **ascending order** of Department and **Descending order** of **Gross Pay**		2	
	Run the Query and Save it as High Income and print a copy		4	
	Write down the query criteria used above		2	
	SUB TOTAL		30	
CONTROL OF INDUSTRIAL PROCESSES	Develop the algorithm of the system		8	
	Draw the flow chart		8	
	Write the sketch required to control the system		8	
	Type the sketch in the Arduino IDE		2	
	Verify the sketch and correct the errors		4	
	Upload the error free c code to the Arduino UNO kit with all the components connected to it(The external supervisor is expected to connect all the components to the Arduino)		4	
	Adjustment and test		6	
	SUB TOTAL		40	
TOTAL			100	

GENERAL CERTIFICATE OF EDUCATION BOARD
Technical and Vocational Education Examination

JUNE 2026 **INTERMEDIATE LEVEL**

Specialty Name and Acronym	**All Industrial Specialties Except FDE, APOP & APIP**
Subject Title	**Industrial Computing**
Subject Code No.	**5650**
Paper No.	**3 (Group 2)**

Duration: Three Hours

INSTRUCTIONS TO CANDIDATES

1. Attempt all questions in the order given.
2. Carefully follow all the instructions given in each exercise.
3. Data in the appendices or candidate folder should be used in the order given

Question 1: Spreadsheet

The table of appendix 1 shows the mark sheet of some students in ST MARY'S COLLEGE.

1. Using a suitable software package, load the file Marksheet that indicates the marks of some form five EPS students. **(3 marks)**
2. Place in cell G4 a function to calculate the *total marks of 'Tita' (Index No.- 1001))* and that of the other students. Write the function in cell G4. **(3 marks)**
3. Place in cell H4 a function to calculate the *average marks of 'Tita' (Index No.- 1001))* and that of the other students. Write the function in cell H4. **(3 marks)**
4. Format the "Average" column to *three decimal places*. **(3 marks)**
5. Place in cell I4 a function to find the *rank of 'Tita' (Index No.- 1001))* and that of the other students. Write the function in cell I4. **(3 marks)**
6. Make a print out. **(1 mark)**
7. Use conditional formatting to change the color of the cells of which the average mark is more than 70, into *green*. Make a print out. **(4 marks)**
8. Select the columns, "Index No", "Electrical Circuits", "Electrical Machines", "Electrical Technology", and "Engineering Science" columns and draw a *column chart*. **(6 marks)**
9. Insert the title, "St Mary's College", and the sub title, "Mark sheet for some form five students" to the top of the chart. Make a print out. **(4 marks)**

(Total = 30 marks)

Question 2: Database

Emaculate has created a database to help him manage customers in a hotel. Details of people who passed a night in the hotel are stored in the **GUEST** table.

1. Open the candidate folder and Open the **DHG2026 database.** **(2 marks)**
2. How many fields are there in the **GUEST table**? **(2 marks)**
3. Which field is most appropriate to be used as the primary key of the **GUEST table**? **(2 marks)**
4. Insert the primary key in the **GUEST table.** **(2 marks)**
5. Add the following records in the **GUEST table**: **(5 marks)**

ID	GENDER	TITLE	FSTNAME	LSTNAME	EMAIL	MOBILE	BIRTHDATE
17	Male	Mr	KALLE	BENNETT	werdna@nospam.ze.tc	23765 900411	07/03/1971
18	Female	Dr	RUTH	KHAN	khan.aliesh@jetable.fr.nf	23765 900393	16/01/1968
19	Female	Ms	SERRI	ROSE	batsaikhanj@mega.zik.dj	23769 900117	09/02/1972
20	Male	Mr	AGBOR	BRANDON	yasinb@gmail.com	23765 900055	01/06/1954

6. Sort the **GUEST** table in ascending order of **FSTNAME.** **(2 marks)**
7. Save and print a copy. **(1 mark)**
8. Using a suitable query extract a list of guests whose **TITLE** is Dr. and save as **Doctors** **(3 marks)**
9. Print a copy. **(1 mark)**
10. Using suitable query extract a list of guests who were born between 1st January 1955 and 31st December 1965. Save as **AGE.** **(3 marks)**
11. Print a copy. **(1 mark)**
12. Create a form based on the table created in step 8 for TITLE_DOCTORS. Save as FORM_DOCTORS. **(3 marks)**
13. Print a copy of the form. (1 mark)
14. Create a relationship between the query table for doctors and the main database **(DHG2026)** and print a copy. **(2 marks)**

(Total = 30 marks)

Question 3: Control of industrial processes

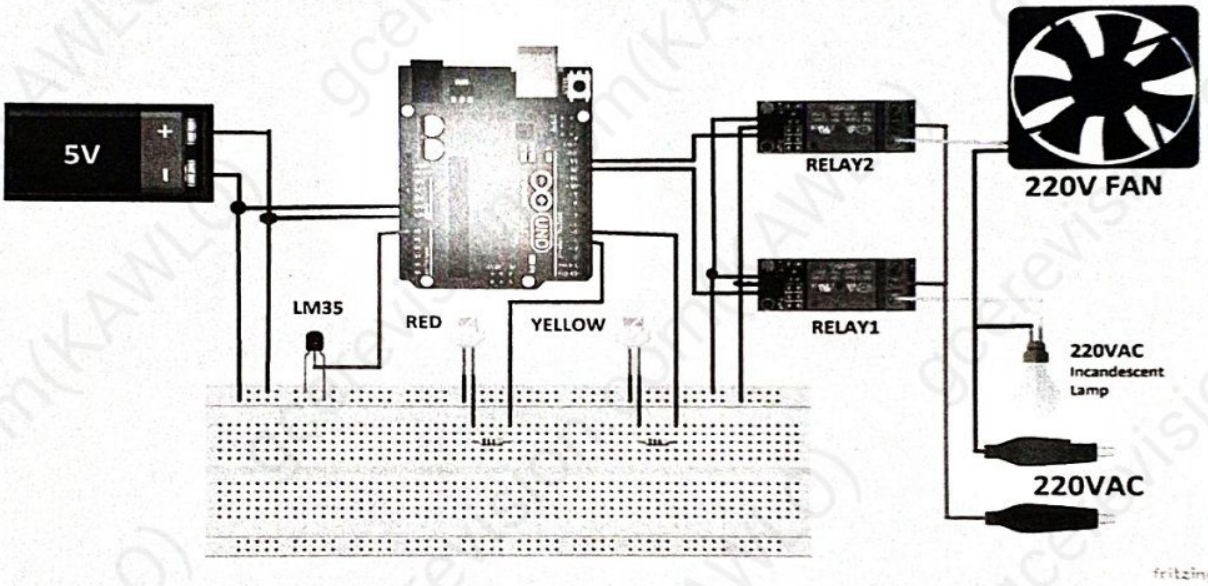
Most manufacturing plant do not have a system to monitor the change in temperature in the furnace. The system to be implemented uses a temperature sensor to monitor the temperature of a chemical manufacturing plant and LEDs to indicate the state of the system.

I- **OPERATING PRINCIPLE**

The system operates as follows.

- At room temperature, 25^{0}C, the heater and the fan are OFF.
- When the temperature is above room temperature, the heater is turned off, the red LED and the fan are turned on.
- When the temperature drops to below room temperature, the fan is turned off, the yellow LED and the heater are turned on

II- **CIRCUIT DIAGRAM OF THE SYSTEM**



III- **Work to be done**

1. Develop the algorithm of the system. **(8 marks)**
2. Draw the flow chart. **(8 marks)**
3. Write the sketch required to control the system. **(8 marks)**
4. Transfer the sketch to the plane sheet of paper provided.
5. Type the sketch in the arduino IDE. **(2 marks)**
6. Verify the sketch and correct the errors. **(4 marks)**
7. Upload the error free sketch to the arduino UNO kit with all the components connected to it(The external supervisor is expected to connect all the components to the arduino). **(4 marks)**
8. Power the automated control system from a 5V battery.
9. Increase the temperature around the LM35 sensor and observe the system. If the temperature is above 27^{0}C, the red LED and the fan come on at the same time. Observe the temperature drops to below 27^{0}C. When the temperature drops to below the threshold value, the yellow LED and the heater comes on at the same time. If the system does not work correctly at the first trial, the candidate is given two more chances to make it work correctly. The candidate loses 5mks after each unsuccessful trial. If after three trials the circuit does not work, it is the duty of the examiners to make it work so that the candidate can continue with the rest of the examination. **(6 marks)**

(Total = 40 marks)

REGISTRATION CENTRE NUMBER	CENTRE NAME	
CANDIDATE'S FULL NAMES		
CANDIDATE IDENTIFICATION NUMBER	SUBJECT CODE **5650**	PAPER NUMBER **3**
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GENERAL CERTIFICATE OF EDUCATION BOARD
Technical and Vocational Education Examination
INTERMEDIATE LEVEL

SUBJECT TITLE: **Industrial Computing**	SUBJECT CODE **5650**	PAPER NUMBER **3**
Specialty: All Industrial Specialties Except FDE, APOP & APIP	EXAMINATION DATE: **JUNE 2026**	

EVALUATION BOOKLET

Question 2: Control of industrial processes

2. Develop the algorithm of the system. **(8 marks)**

3. Draw the flow chart **(8 marks)**

EVALUATION SHEET

EXERCISE	CONTENT	DURATION	MARKS ALLOCATION	MARKS SCORED
SPREADSHEET	Using a suitable software package, load the file Marsheet that indicates the marks of some form five EPS students.	1 hour	3	
	Place in cell G4 a function to calculate the *total marks of 'Tita' (Index No. - 1001)*) and that of the other students. Write the function in cell G4.		3	
	Place in cell H4 a function to calculate the *average marks of 'Tita' (Index No. - 1001)*) and that of the other students. Write the function in cell H4.		3	
	Format the "Average" column to *three decimal places*.		3	
	Place in cell I4 a function to find the *rank of 'Tita' (Index No. - 1001)*) and that of the other students. Write the function in cell I4.		4	
	Use conditional formatting to change the color of the cells of which the average mark is more than 70, into *green*. Make a print out.		4	
	Select the columns, "Index No", "Electrical Circuits", "Electrical Machines", "Electrical Technology", and "Engineering Science" columns and draw a *column chart*.		6	
	Insert the title, "St Mary's College", and the sub title, "Mark sheet for some form five students" to the top of the chart. Make a print out.		4	
	SUB TOTAL		30	
DATABASE	Open the candidate folder and Open the DHG2026 database	1hour	2	
	How many fields are there in the GUEST table?		2	
	Which field is most appropriate to be used as the primary key of the GUEST table?		2	
	Insert the primary key in the GUEST table		2	
	Adding of records in the **GUEST table**		5	
	Sort the **GUEST** table in ascending order of **FSTNAME.**		2	
	Save and print a copy		1	
	Using a suitable query extract a list of guests whose TITLE is Dr. and save as Doctors		3	
	Print a copy		1	
	Use suitable query to extract a list of guests who were born between 1st January 1955 and 31st December 1965. Save as AGE.		3	
	Print a copty		1	
	Create a form based on the table created in step 8 for TITLE_DOCTORS. Save as FORM_DOCTORS.		3	
	Print a copy		1	
	Create a relationship between the query table for doctors and the main database (DHG2026) and print a copy.		2	
	SUB TOTAL		30	
CONTROL OF INDUSTRIAL PROCESSES	Develop the algorithm of the system		8	
	Draw the flow chart		8	
	Write the sketch required to control the system		8	
	Type the sketch in the arduino IDE		2	
	Verify the sketch and correct the errors		4	
	Upload the error free c code to the arduino UNO kit with all the components connected to it(The external supervisor is expected to connect all the components to the arduino)		4	
	Adjustment and test		6	
	SUB TOTAL		40	
TOTAL			100	

Industrial Computing 3
5650

GENERAL CERTIFICATE OF EDUCATION BOARD
Technical and Vocational Education Examination

JUNE 2026 **INTERMEDIATE LEVEL**

Specialty Name and Acronym	**ALL INDUSTRIAL SPECIALTIES**
Subject Title	**Industrial Computing**
Subject Code No.	**5650**
Paper No.	**3 (Group 3)**

Duration: Three Hours

INSTRUCTIONS TO CANDIDATES

1. Attempt all questions in the order given.
2. Carefully follow all the instructions given in each exercise.
3. Data in the appendices or candidate folder should be used in the order given

Turn Over

Question 1: Spreadsheet

1.

a) Open the Candidate folder provided and open the spreadsheet **Homeland Traders.xlsx** **(1 mark)**

b) On the **Home Master** worksheet use a Date Function in Cell C3 that will return the current date whenever the spreadsheet is open. **(1 mark)**

c) Write out the Date Function or Code as used in C3 above _____ **(1 mark)**

2.

a) In **cell H8** use an appropriate Formula to calculate the **Actual Units Sold** based on the **Number of Sales Units Sold** and the **Value of Sales Units.** **(3 marks)**

b) Copy and apply the formula to get the results of the remaining products from Cell **H9** to **H37.** **(1 mark)**

c) Write down the formula in **Cell H10.** _____ **(2 marks)**

3.

a) In **cell I8**, use an appropriate Formula to calculate the Total Sold based on the **Unit Price** and the **Actual Number Sold.** **(2 marks)**

Copy and apply the formula to the remaining cells **I9** to **I37.** **(1 marks)**

b) In cell **I39**, use a suitable formula to calculate the Grand Total of the Total Sold. **(1 marks)**

c) Write the function used in **Cell I9** and **I37** above. _____ **(2 marks)**

4.

a) Sort the table in **Descending** order of **Product Type**, then by the **Total Sold** from the highest to the lowest. **(2 marks)**

b) Apply Borders to the entire table in the range A7 to I37. **(1 marks)**

c) Add a shading colour of your choice to the header row from A7 to I7. **(1 marks)**

d) Merge and centre the heading in the cell range **A1** to **I1**. Change the Font type to **Arial Black** and font size to **16pts.** **(2 marks)**

e) Adjust your page layout as follows: **Paper size A4**, Scale to fit to **1page.** **(1 mark)**

f) **Print** a copy of your **Home Master** Worksheet. **(2 marks)**

5. Switch to the worksheet **Homeland Chart.**

a) Use the data to insert a chart as follows:

i) Chart Type; **Pie Chart** **(1 mark)**

ii) Chart Title: **Homeland Traders Sales** **(1 mark)**

iii) Add chart **labels** and display in **Percentage** as well. **(1 mark)**

iv) Position the chart below the Chart Data table starting from Row 9. **(1 mark)**

v) Write down the value and percentage of the **Plumbing** product type as indicated on the chart

_____ **(1 marks)**

b) Print a copy of the chart in 5a) above. **(1 mark)**

(Total = 30 marks)

Question 2: Database

1. a) Open the Candidate folder provided and open the database file **Coastal Trading Center.accdb**
Open the **Customers** database and Identify the Primary Key field.

Write the name of the Identified field here: _____ **(1 marks)**

b) Switch to design mode and assign the Primary key you have identified in 1a) above. **(1 mark)**

c) Indicate the number of Fields and Records that are found on the **Customers** Database.

No of Fields	No of Records

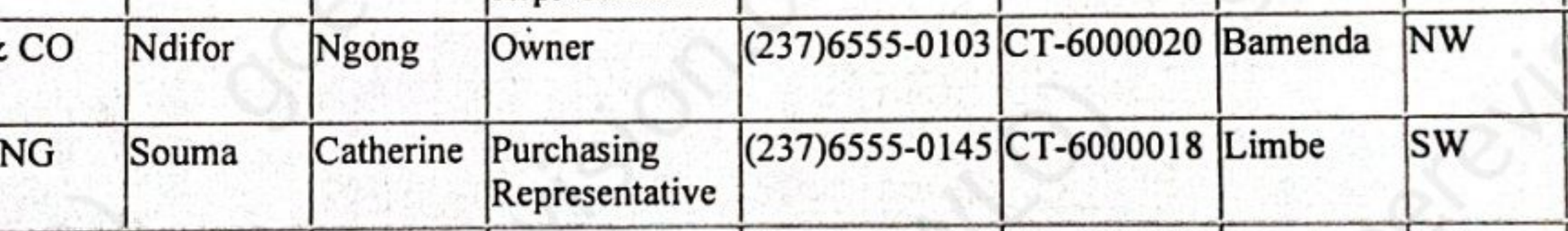
(2 marks)

d) Fill in the appropriate data types as used in the **Customers** and **Orders** Databases.

Field Name	ID	Job Title	Work Phone	Order ID	Delivery Date	Order Level
Data Type						

(3 marks)

2. a) Normalize your database by creating the following relationship



(2 marks)

b) Use suitable criteria to generate a relationship report in Portrait layout, then print and save it as **Customer Links.** **(2 marks)**

c) Add the following Records to the Customers database;

ID	Company	Last Name	First Name	Job Title	Work Phone	Order No	City	Region	Country
16	Top Line Bakery	Awah	Daniel	Purchasing Representative	(237)6555-0190	CT-600007	Yaounde	CE	Cameroon
17	Ndifor & CO Ltd	Ndifor	Ngong	Owner	(237)6555-0103	CT-6000020	Bamenda	NW	Cameroon
18	SAMSUNG Ltd	Souma	Catherine	Purchasing Representative	(237)6555-0145	CT-6000018	Limbe	SW	Cameroon
19	OMEGA SA	Engwari	Akom	Accounting Assistant	(237)6555-0175	CT-6000019	Douala	LT	Cameroon
20	HUAWEI CM	Lonkeng	George	Purchasing Manager	(237)6555-0129	CT-6000010	Douala	LT	Cameroon

(5 marks)

d) (i) In your database design of the **Customer** database, add the caption **Region** to the StateProvince field. Set the field size to **15** characters. **(2 marks)**

(ii) Change the text alignment of the StateProvince field to **Center.** **(1 mark)**

3. a) Create a query using the following tables **Customers** and **Orders**. Add the following fields from the Customers table (**ID, Company, First Name, Job Title, City, StateProvince**) and **Delivery Date** from the Orders table. **(3 mark)**

b) Add a query expression that will select only customers from the SW or LT Regions. Sort the **Delivery Date** field in **ascending** order. **(3 marks)**

c) Run the query, **save** a copy as **Coastal Customers** **(2 marks)**

d) Write down the query criteria for **Regions** used in 3b above. _____ **(2 marks)**

e) **Print** a copy of the Coastal Customers query. **(1 mark)**

(Total = 30 marks)

Question 3: Control of industrial processes

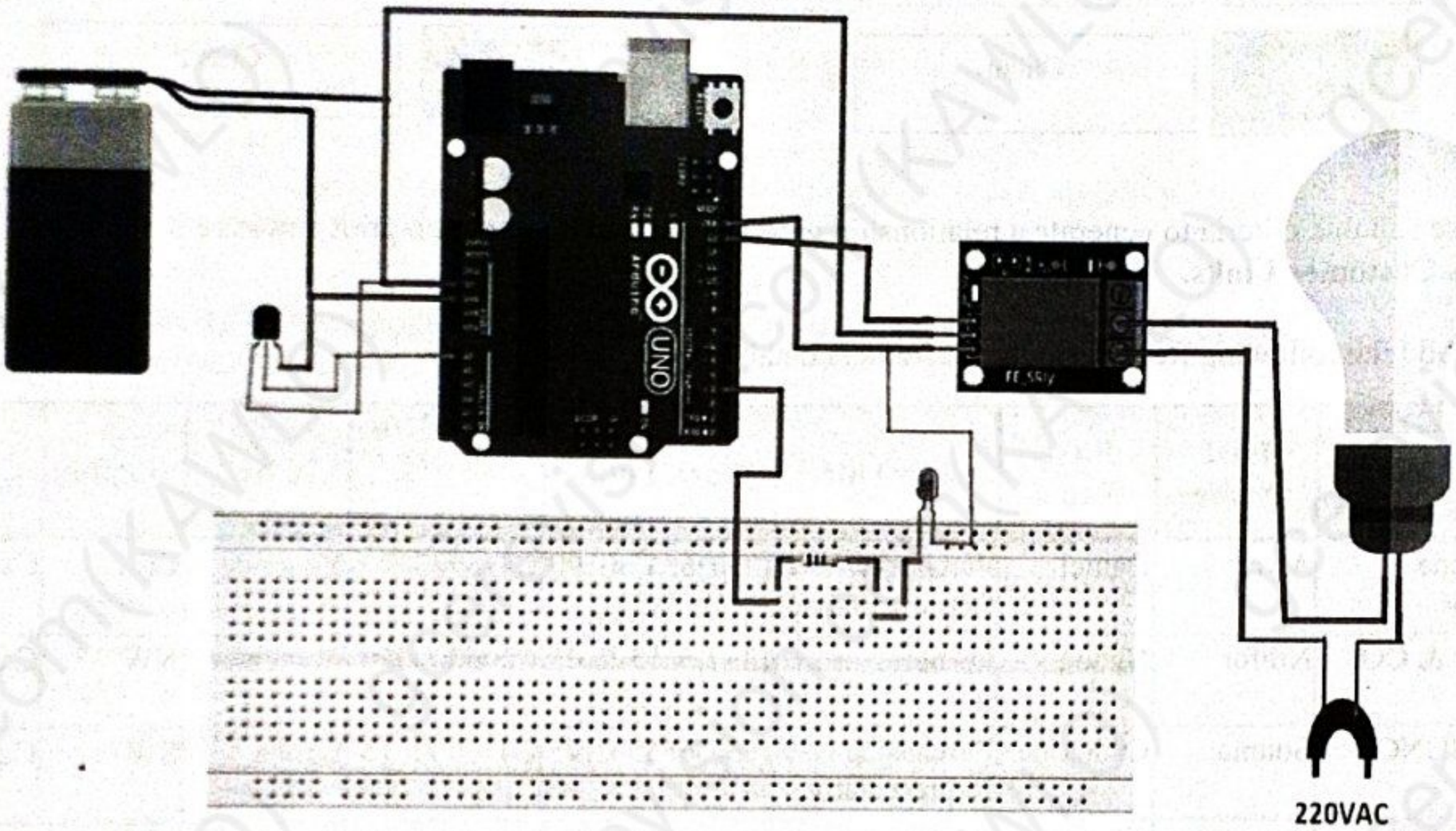
The system to be implemented automatically turns ON and OFF a heater in an egg incubator. This system uses a temperature sensor to monitor the temperature in the incubator and an incandescent lamp as the heater.

I- **OPERATING PRINCIPLE**

The system operates as follows.

- At room temperature, 25°C, the lamp is on.
- When the temperature is above 60°C, the lamp is turned off and a red LED is turned on.
- When the temperature drops to below 60°C, the lamp is turned on, the red LED is turned off

II- **CIRCUIT DIAGRAM OF THE SYSTEM**



III- **Work to be done**

1. Develop the algorithm of the system. **(8 marks)**
2. Draw the flow chart. **(8 marks)**
3. Write the sketch required to control the system. **(8 marks)**
4. Transfer the sketch to the plane sheet of paper provided.
5. Type the sketch in the Arduino IDE. **(2 marks)**
6. Verify the sketch and correct the errors. **(4 marks)**
7. Upload the error free sketch to the Arduino UNO kit with all the components connected to it(The external supervisor is expected to connect all the components to the Arduino). **(4 marks)**
8. Power the automated control system from a 5V power supply.
9. Increase the temperature around the LM35 sensor and observe the system. If the temperature is above 60°C, the red LED comes on and the incandescent lamp goes off. Observe the temperature drops to below 60°C. When the temperature drops to below the threshold value, the red LED goes off and the incandescent lamp comes on at the same time. If the system does not work correctly at the first trial, the candidate is given two more chances to make it work correctly. The candidate loses 5mks after each unsuccessful trial. If after three trials the circuit does not work, it is the duty of the examiners to make it work so that the candidate can continue with the rest of the examination. **(6 marks)**

(Total = 40 marks)

Question 3: Control of industrial processes

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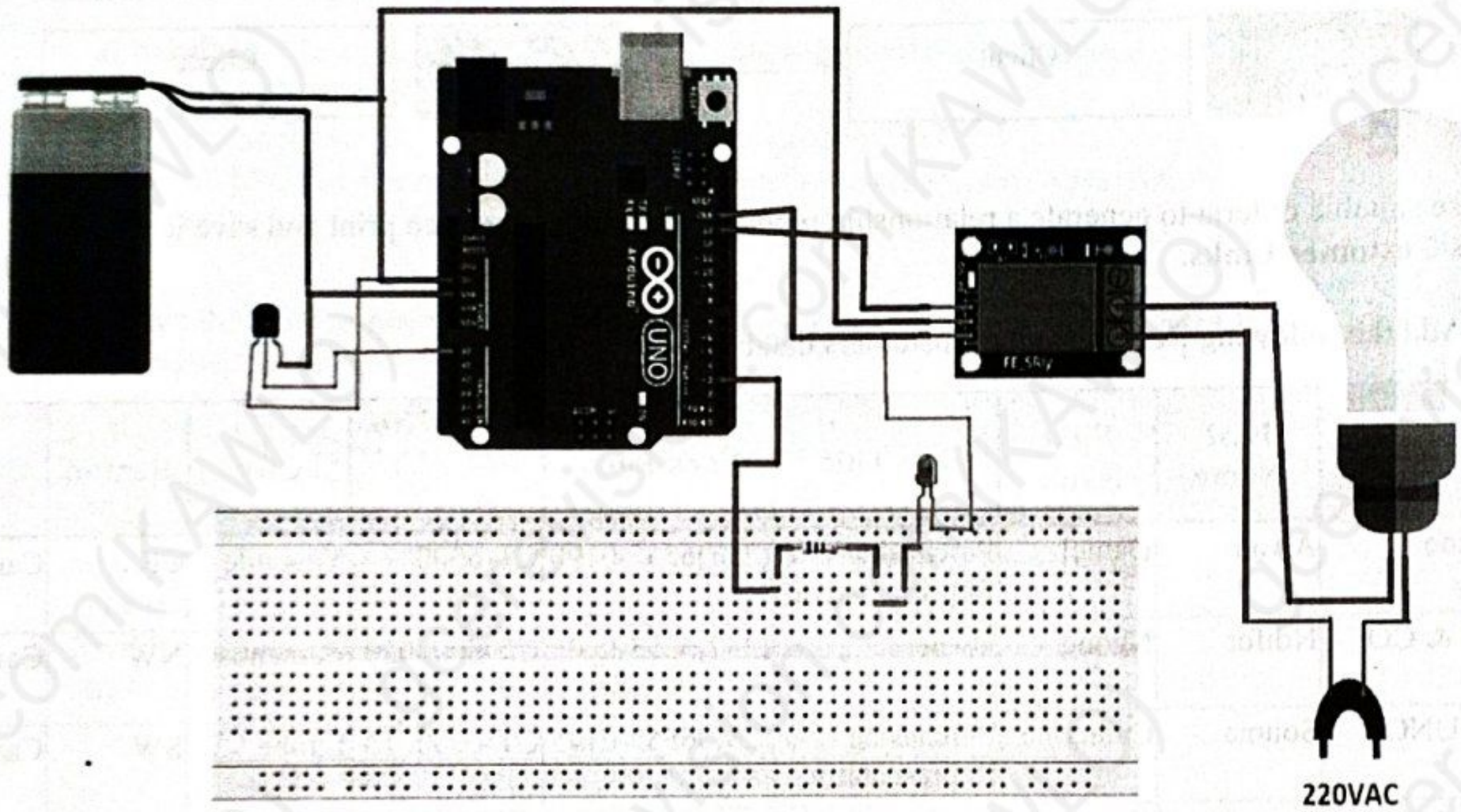
The system operates as follows.

- At room temperature, 25^0C, the lamp is on.
- When the temperature is above 60^0C, the lamp is turned off and a red LED is turned on.
- When the temperature drops to below 60^0C, the lamp is turned on, the red LED is turned off

II- CIRCUIT DIAGRAM OF THE SYSTEM



III- **Work to be done**

1. Develop the algorithm of the system. **(8 marks)**
2. Draw the flow chart. **(8 marks)**
3. Write the sketch required to control the system. **(8 marks)**
4. Transfer the sketch to the plane sheet of paper provided.
5. Type the sketch in the Arduino IDE. **(2 marks)**
6. Verify the sketch and correct the errors. **(4 marks)**
7. Upload the error free sketch to the Arduino UNO kit with all the components connected to it(The external supervisor is expected to connect all the components to the Arduino). **(4 marks)**
8. Power the automated control system from a 5V power supply.
9. Increase the temperature around the LM35 sensor and observe the system. If the temperature is above 60^0C, the red LED comes on and the incandescent lamp goes off. Observe the temperature drops to below 60^0C. When the temperature drops to below the threshold value, the red LED goes off and the incandescent lamp comes on at the same time. If the system does not work correctly at the first trial, the candidate is given two more chances to make it work correctly. The candidate loses 5mks after each unsuccessful trial. If after three trials the circuit does not work, it is the duty of the examiners to make it work so that the candidate can continue with the rest of the examination. **(6 marks)**

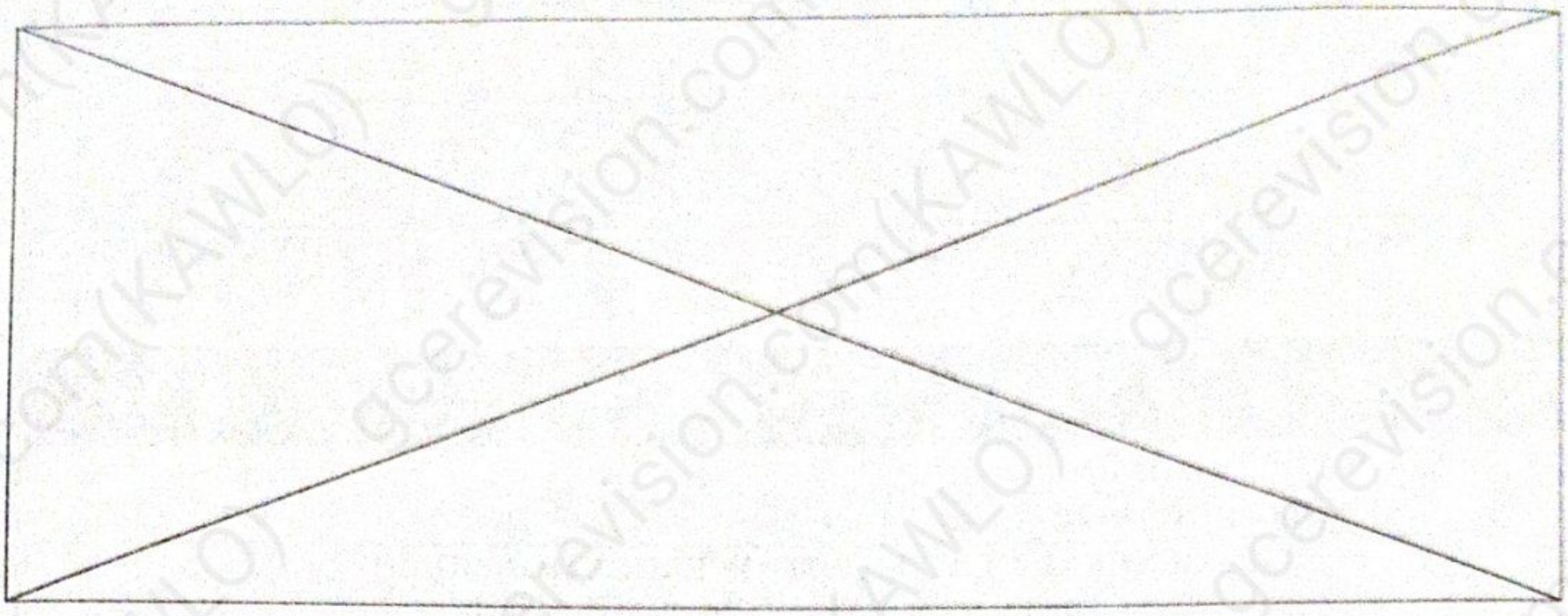
(Total = 40 marks)

REGISTRATION CENTRE NUMBER	CENTRE NAME	
CANDIDATE'S FULL NAMES		
CANDIDATE IDENTIFICATION NUMBER	SUBJECT CODE **5650**	PAPER NUMBER **3**
FOR OFFICIAL USE ONLY (Candidate Random Code) ▶		

GENERAL CERTIFICATE OF EDUCATION BOARD
Technical and Vocational Education Examination
INTERMEDIATE LEVEL

SUBJECT TITLE: **Industrial Computing**	SUBJECT CODE **5650**	PAPER NUMBER **3**
Specialty: All Industrial Specialties Except FDE, APOP & APIP	EXAMINATION DATE: **JUNE 2026**	

EVALUATION BOOKLET



Question 3: Control of industrial processes

1. Develop the algorithm of the system. **(8 marks)**

2. Draw the flow chart. **(8 marks)**

3. Write the sketch required to control the system. **(8 marks)**

EVALUATION SHEET

EXERCISE	CONTENT	DURATION	MARKS ALLOCATION	MARKS SCORED
SPREADSHEET	Open the Candidate folder provided and open the spreadsheet Homeland Traders.xlsx	1 hour	1	
	On the Home Master worksheet use a Date Function in Cell C3 that will return the current date		1	
	Write out the Date Function or Code as used in C3 above		1	
	In cell H8 use an appropriate Formula to calculate the Actual Units Sold based on the Number **of Sales Units Sold** and the **Value of Sales Units.**		3	
	Copy and apply the formula to get the results of the remaining products from Cell H9 to H37		1	
	Write down the formula in Cell H10		2	
	In cell I8, use an appropriate Formula to calculate the Total Sold based on the Unit Price and the Actual Number Sold.		2	
	Copy and apply the formula to the remaining cells I9 to I37		1	
	In cell I39, use a suitable formula to calculate the Grand Total of the Total Sold.		1	
	Write the function used in Cell I9 and I37 above		2	
	Sort the table in Descending order of Product Type, then by the Total Sold from the highest to the lowest.		2	
	Apply Borders to the entire table in the range A7 to I37		1	
	Add a shading colour of your choice to the header row from A7 to I7		1	
	Merge and centre the heading in the cell range A1 to I1. Change the Font type to Arial Black and font size to 16pts		2	
	Adjust your page layout as follows: Paper size A4, Scale to fit to 1page		1	
	Print a copy of your Home Master Worksheet		2	
	Chart Type; Pie Chart		1	
	Chart Title: Homeland Traders Sales		1	
	Add chart labels and display in Percentage as well.		1	
	Position the chart below the Chart Data table starting from Row 9.		1	
	Write down the value and percentage of the Plumbing product type as indicated on the chart		1	
	Print a copy of the chart in 5a) above.		1	
	SUB TOTAL		30	
DATABASE	Write the name of the primary key	1hour	1	
	Switch to design mode and assign the Primary key you have identified in 1a) above		1	
	Indicate the number of Fields and Records that are found on the Customers Database		2	
	Fill in the appropriate data types as used in the Customers and Orders Databases.		3	
	Normalize your database by creating the following relationship		2	
	Use suitable criteria to generate a relationship report in Portrait layout, then print and save it as Customer Links.		2	
	Adding Records to the Customers database		5	
	In your database design of the Customer database, add the caption Region to the StateProvince field. Set the field size to 15 characters		2	
	Change the text alignment of the StateProvince field to Center		1	

	Create a query using the following tables Customers and Orders. Add the following fields from the Customers table (ID, Company, First Name, Job Title, City, StateProvince) and Delivery Date from the Orders table		3	
	Add a query expression that will select only customers from the SW or LT Regions. Sort the Delivery Date field in ascending order		3	
	Run the query, save a copy as Coastal Customers		2	
	Write down the query criteria for Regions used in 3b above		2	
	Print a copy of the Coastal Customers query		1	
	SUB TOTAL		30	
CONTROL OF INDUSTRIAL PROCESSES	Develop the algorithm of the system		8	
	Draw the flow chart		8	
	Write the sketch required to control the system		8	
	Type the sketch in the arduino IDE		2	
	Verify the sketch and correct the errors		4	
	Upload the error free c code to the arduino UNO kit with all the components connected to it(The external supervisor is expected to connect all the components to the arduino)		4	
	Adjustment and test		6	
	SUB TOTAL		40	
TOTAL			100	