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COMPUTER SCIENCE

2210/22

Paper 2 Problem-solving and Programming

October/November 2020

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- **Do not attempt Tasks 1, 2 and 3** in the copy of the pre-release material on page 2; these are for information only.
- 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.

This document has **12** pages. Blank pages are indicated.

Section A

You are advised to spend no longer than 40 minutes answering this section.

Here is a copy of the pre-release material.

DO NOT attempt Tasks 1, 2 and 3 now.

Use the pre-release material and your experience from attempting the tasks before the examination to answer Question 1.

Pre-release material

An online computer shop sells customised personal computers. Every computer sold includes a basic set of components costing \$200 and additional items can be added from the table:

| Category | Item code | Description | Price (\$) |
|------------------------|-----------|-----------------------|------------|
| Case | A1 | Compact | 75.00 |
| Case | A2 | Tower | 150.00 |
| RAM | B1 | 8 GB | 79.99 |
| RAM | B2 | 16 GB | 149.99 |
| RAM | B3 | 32 GB | 299.99 |
| Main Hard Disk Drive | C1 | 1 TB HDD | 49.99 |
| Main Hard Disk Drive | C2 | 2 TB HDD | 89.99 |
| Main Hard Disk Drive | C3 | 4 TB HDD | 129.99 |
| Solid State Drive | D1 | 240 GB SSD | 59.99 |
| Solid State Drive | D2 | 480 GB SSD | 119.99 |
| Second Hard Disk Drive | E1 | 1 TB HDD | 49.99 |
| Second Hard Disk Drive | E2 | 2 TB HDD | 89.99 |
| Second Hard Disk Drive | E3 | 4 TB HDD | 129.99 |
| Optical Drive | F1 | DVD/Blu-Ray Player | 50.00 |
| Optical Drive | F2 | DVD/Blu-Ray Re-writer | 100.00 |
| Operating System | G1 | Standard Version | 100.00 |
| Operating System | G2 | Professional Version | 175.00 |

As well as the basic set of components every computer must include one case, one RAM and one Main Hard Disk Drive from the table.

A computer is supplied with or without an Operating System.

Write and test a program or programs for the online computer shop.

- Your program or programs must include appropriate prompts for the entry of data; data must be validated on entry.
- Error messages and other output need to be set out clearly and understandably.
- All arrays, variables, constants and other identifiers must have meaningful names.

You will need to complete these **three** tasks. Each task must be fully tested.

Task 1 – Setting up the system and ordering the main items.

Write a program to:

- use arrays to store the item code, description and price
- allow a customer to choose one case, one RAM and one Main Hard Disk Drive
- calculate the price of the computer using the cost of the chosen items and the basic set of components
- store and output the chosen items and the price of the computer.

Task 2 – Ordering additional items.

Extend TASK 1 to:

- allow a customer to choose whether to purchase any items from the other categories – if so, which item(s)
- update the price of the computer
- store and output the additional items and the new price of the computer.

Task 3 – Offering discounts.

Extend TASK 2 to:

- apply a 5% discount to the price of the computer if the customer has bought only one additional item
- apply a 10% discount to the price of the computer if the customer has bought two or more additional items
- output the amount of money saved and the new price of the computer after the discount.

1 All variables, constants and other identifiers must have meaningful names.

(a) (i) Identify **one** array you could have used for **Task 1** and state its purpose.

Array

Purpose

.....

.....

[2]

(ii) Identify **one** variable you could have used for **Task 2** and state its purpose.

Variable

Purpose

.....

.....

[2]

(iii) Identify **one** constant you could have used for **Task 3** and state its purpose.

Constant

Purpose

.....

.....

[2]

(b) Explain the benefits of storing Price as a real data type.

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[2]

(d) Explain how your program completes **Task 3**. Any programming statements used in your answer must be fully explained.

Lined area for writing the answer, consisting of numerous horizontal dashed lines.

[4]

(e) Describe how you could alter your program to allow more than one computer to be bought.

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..... [2]

Section B

2 Tick (✓) **one** box in each row to identify if the statement about subroutines is **true** or **false**.

| Statement | true (✓) | false (✓) |
|--|-------------|--------------|
| A subroutine is called from within a program. | | |
| A subroutine is not a complete program. | | |
| A subroutine is a self-contained piece of code. | | |
| A subroutine must return a value to the code from which it was called. | | |

[2]

3 This pseudocode algorithm is used as a validation check.

```

PRINT "Input a number from 1 to 5000"
REPEAT
    INPUT Number
    IF Number < 1 OR Number > 5000
        THEN
            PRINT "Invalid number, please try again"
        ENDIF
UNTIL Number >= 1 AND Number <= 5000
PRINT Number, " is within the correct range"
    
```

Identify **three** different types of test data. For each type, give an example of the test data you would use to test this algorithm and state a reason for your choice of test.

Type of test data 1

Test data

Reason

.....

Type of test data 2

Test data

Reason

.....

Type of test data 3

Test data

Reason

.....

[6]

5 This pseudocode represents an algorithm.

```
REPEAT  
  Flag ← 0  
  FOR Count ← 0 to 3  
    IF Num[Count] < Num[Count + 1]  
      THEN  
        Store ← Num[Count]  
        Num[Count] ← Num[Count + 1]  
        Num[Count + 1] ← Store  
        Flag ← 1  
      ENDIF  
  NEXT Count  
UNTIL Flag = 0
```

(a) The contents of the array at the start of the algorithm are:

| Num[0] | Num[1] | Num[2] | Num[3] | Num[4] |
|--------|--------|--------|--------|--------|
| 45 | 56 | 30 | 12 | 15 |

Complete the trace table for the algorithm using the data given in the array.

| Flag | Count | Num[0] | Num[1] | Num[2] | Num[3] | Num[4] | Store |
|------|-------|--------|--------|--------|--------|--------|-------|
| | | 45 | 56 | 30 | 12 | 15 | |
| | | | | | | | |
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[5]

(b) Describe the purpose of the algorithm.

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..... [2]

6 Draw a flowchart symbol to represent each of the following:

| Input/Output | Decision |
|--------------|----------|
| | |

[2]

Question 7 starts on Page 12.

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- 7 The table AUDIOPARTS stores the part number, description, cost and quantity in stock of the items sold by a music shop.

| PartNum | Description | Cost | Quantity |
|---------|----------------------------|--------|----------|
| A01 | Compact Amplifier Case | 50.00 | 15 |
| A02 | Deluxe Amplifier Case | 75.00 | 1 |
| A03 | Amplifier Standard | 79.99 | 48 |
| A04 | Amplifier Midrange | 149.99 | 50 |
| A05 | Amplifier Megablaster | 299.99 | 48 |
| S01 | Tweeter | 59.99 | 10 |
| S02 | Midrange Woofer | 99.99 | 0 |
| S03 | Subwoofer | 139.99 | 16 |
| S04 | Tower Speaker Basic | 159.99 | 25 |
| S05 | Tower Speaker Skyscraper | 219.99 | 9 |
| S06 | Centre Speaker | 149.99 | 25 |
| S07 | Soundbar | 89.99 | 2 |
| S20 | Soundbar | 129.99 | 0 |
| S21 | Ceiling Surround Speaker | 75.00 | 15 |
| S22 | Ceiling Full Range Speaker | 100.00 | 1 |
| S25 | Surround Speaker | 100.00 | 60 |
| T19 | Speaker Stands (Pair) | 75.00 | 60 |

- (a) State the number of records in the table AUDIOPARTS

..... [1]

- (b) Identify the field that is most suitable to be a primary key and give a reason for your choice.

Fieldname

Reason

.....

.....

[2]

- (c) Complete the query-by-example grid to show the items where the quantity in stock is fewer than 10. Show all the fields from the database table in descending order of cost.

| | | | | |
|-----------|--------------------------|--------------------------|--------------------------|--------------------------|
| Field: | | | | |
| Table: | | | | |
| Sort: | | | | |
| Show: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Criteria: | | | | |
| or: | | | | |