



GCE AS/A LEVEL

2500U20-1

MONDAY, 22 MAY 2023 – AFTERNOON

COMPUTER SCIENCE – AS unit 2

Practical Programming to Solve Problems

2 hours plus your additional time allowance

INSTRUCTIONS TO CANDIDATES

The question paper is divided into two main sections. Below are the recommended timings for this assessment.

SECTION A

Answer ALL questions in SECTION A.

You are advised to spend no more than 60 MINUTES on this section.

You will be required to analyse and deconstruct the scenario to consider its component parts in terms that can be addressed through automated computation.

SECTION B

Select the programming language of your choice from section BI, BII or BIII and answer ALL questions within your chosen section.

You are advised to spend no more than 60 MINUTES on this section.

You will be required to develop programs that solve computing problems referring to the initial scenario.

(Turn over)

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

The total number of marks available is 60.

You will need a computer with an installed functional copy of the Integrated Development Environment (IDE) appropriate to your chosen programming language and word processing software.

A calculator is allowed in this examination.

SCENARIO

Sky Balloon Park



(Turn over)

Sky Balloon Park is a small hot air ballooning company that offers trips in their hot air balloons.

Sky Balloon Park needs a computer system that will allow it to handle bookings for its hot air balloon trips. **Sky Balloon Park** is hoping to encourage repeat bookings for the trips it offers.

Sky Balloon Park maintains a list of possible trips in a table. A trip may be booked by multiple passengers, a passenger may wish to book multiple trips. Some of the details that **Sky Balloon Park** needs to store about its trips include: Trip ID, Date of trip, Time and Description.

Sky Balloon Park needs a method that calculates the total weight of the balloon for a given booking to ensure that it can safely ascend on a particular trip.

The main requirements of the new computer system for **Sky Balloon Park** are to:

- store details about trips, bookings and customers.
- carry out simple calculations such as calculating the total weight for a booking.

SECTION A: ANALYSIS AND DESIGN

Answer all questions (1–4) in this section.

You have been asked to analyse the scenario as a preliminary step towards creating a prototype computer system for **Sky Balloon Park.**

Present your answers as a single word-processed document named: SECTION A

- 1. (a) Create an entity relationship diagram for the booking system described in the scenario. There is no need to include any attributes. [5 marks]**

- (b) Create a data structure table, including suitable validation checks, for TWO of the tables in your entity relationship diagram. [10 marks]**

(Turn over)

2. **Select and fully justify your proposed programming method of solution for Sky Balloon Park.**

You should include references to the main programming constructs you will need to use including:

- **User interface**
- **Data structures**
- **File handling**
- **Validation**
- **Local and global variables**
- **Data types [6 marks]**

3. **Describe the processes that Sky Balloon Park could use to protect the security and integrity of data it stores about its customers.**

[7 marks]

4. (a) **Sky Balloon Park** uses the algorithm on the separate A3 sheet opposite to calculate the total weight for the next balloon trip.

Copy and complete the table below showing the contents of the array `weight` for the input provided. [8 marks]

`passengers = 4`

<code>weight</code> <code>[i,1]</code>				
<code>weight</code> <code>[i,2]</code>				

(Turn over)

4 (b) From the algorithm given identify an example of the following and describe its role in the algorithm:

- **Constant**
- **Local variable**
- **Global variable**
- **Self-documenting identifier**
- **Annotation**
- **Procedure calling**
- **Parameter passing**
- **Return a value.**

Save your answers as a single word-processed document named: SECTION A [8 marks]

SECTION B: DEVELOP PROGRAMS

Select the programming language of your choice from section BI, BII or BIII and answer all questions within your chosen section.

BI VISUAL BASIC

Sky Balloon Park wants a prototype computer system to be developed using Visual Basic.

- 1. Open the file SKYCUSTOMERS**
 - Read through the code and familiarise yourself with its contents.**
 - The file contains incomplete code which attempts to save customer details and return the number of customers on file that match the search criteria entered.**

COMPLETE THIS CODE.

Save the changes made to the file. [4 marks]

2. Using the internal facility of your chosen language, **ANNOTATE** the code from Question BI on page 10 to clearly explain the design of this program to another software developer.

Save the annotation within the file. [4 marks]

3. Create a new program to allow **Sky Balloon Park** to record details about upcoming trips.

The new program must accept:

- o TripID
- o Date
- o Time
- o Description

The program should have a **Save** facility and a **Load** facility.

Save the new program as Trips. [8 marks]

BII JAVA

Sky Balloon Park wants a prototype computer system to be developed using Java

- 1. Open the file SKYCUSTOMERS**
 - Read through the code and familiarise yourself with its contents.**
 - The file contains incomplete code which attempts to save customer details and return the number of customers on file that match the search criteria entered.**

COMPLETE THIS CODE.

Save the changes made to the file. [4 marks]

- 2. Using the internal facility of your chosen language, ANNOTATE the code from Question BII above to clearly explain the design of this program to another software developer.**

Save the annotation within the file. [4 marks]

3. Create a new program to allow **Sky Balloon Park** to record details about upcoming trips.

The new program must accept:

- o TripID
- o Date
- o Time
- o Description

The program should have a Save facility and a Load facility.

Save the new program as Trips. [8 marks]

BIII PYTHON

Sky Balloon Park wants a prototype computer system to be developed using Python.

- 1. Open the file SKYCUSTOMERS**
 - **Read the code and familiarise yourself with its contents.**
 - **The file contains incomplete code which attempts to save customer details and return the number of customers on file that match the search criteria entered.**

COMPLETE THIS CODE.

Save the changes made to the file. [4 marks]

- 2. Using the internal facility of your chosen language, ANNOTATE the code from Question BIII above to clearly explain the design of this program to another software developer.**

Save the annotation within the file. [4 marks]

3. Create a new program to allow **Sky Balloon Park** to record details about upcoming trips.

The new program must accept:

- o TripID
- o Date
- o Time
- o Description

The program should have a **Save** facility and a **Load** facility.

Save the new program as Trips. [8 marks]

END OF PAPER

```
1      declare weight[4,2] as integer
2      declare constant PASSENGERWEIGHT = 150
3              {average weight of a passenger}
4
5      declare subroutine fillArray(passengers)
6
7          for i = 1 to passengers
8              weight[i,1] = i
9              weight[i,2] = i * PASSENGERWEIGHT
10         next i
11
12         if passengers >0 then
13             return TRUE
14         else
15             return FALSE
16         end if
17
18     end subroutine
19
20     startMainProg
21         declare passengers as integer
22         declare completed as Boolean
23
24         output "Type in the number of passengers"
25         input passengers
26
27         completed = fillArray(passengers)
28         if completed = TRUE then
29             output "Subroutine completed successfully"
30         end if
31
32     endMainProg
33
34     end
```