



JUNE 2016

PROGRAMMING

**Instructions to candidates:**

- a) Time allowed: Three hours (plus an extra ten minutes' reading time at the start – do not write anything during this time)
- b) Answer ALL parts of Question 1 (40 marks) and any FOUR other questions (15 marks each)
- c) Marks for subsections of questions are shown in [ ]
- d) Spend about 1 hour on Question 1 and just under 30 minutes on each other question. Read CAREFULLY the particular instructions for Question 1
- e) State at the top of your answer FOR EACH QUESTION, where appropriate, the programming language and version you are using for that question. Different languages may be used
- f) Ensure that you pay particular attention to words underlined, in CAPITALS or in **bold**. FEW OR NO MARKS will be awarded to any question where these are ignored
- g) No computer equipment, books or notes may be used in this examination

General instructions for QUESTION 1: Answer all parts of this question.

- Provide high-level language solutions to each question in this section
- Do NOT provide coding for anything outside the question – complete programs are NOT required
- Do not change the names of variables or file names in your answers
- Data only needs to be input where the question specifically states "INPUT"
- Any additional temporary variables YOU introduce must have clear meaningful names and be assigned with initial values

1. a) Write a routine to output a sequence of integers with a common difference.  
For example: 3 7 11 15 19. Here, each number is 4 larger than the previous one. Display the numbers across a SINGLE line of the screen.  
The routine should input:  
FIRST The first number of the sequence (3 in the example above)  
DIFF The difference between successive numbers (4 in the example above)  
COUNT Count of numbers of how many numbers to display (including the first) [7]
- b) The Fibonacci Sequence is a series of integers in which each number is the sum of the previous two.  
For example: 1 1 2 3 5 8 13 21 34 55. Here,  $3 + 5 = 8$  and  $8 + 13 = 21$  etc.  
Different series can be generated by beginning the series with two different starting numbers.  
Write a routine to display all the numbers (including the first two) until a limiting number is reached.  
The input for the program is:
  - the first two numbers and
  - the limit – this means stop printing AFTER the first number reaches this limit in value [9]
- c) A small business requires a program to accurately calculate and print invoices for its customers. The invoices will be printed on headed paper that already contains the business information but the date **must be captured from the system** and printed near the top of the invoice. The user inputs a stock item description along with price and quantity purchased. The program calculates the total price for that item and keeps track of the invoice total as each item is entered. The program will continue to ask for item, price and quantity until "x" is entered instead of item description.  
You will need to store the details of each item in an array (or alternative structure) until the program is ready to print the invoice.  
Your print statements should include code that accurately positions each item on the invoice.

An invoice might look something like the one shown below:

<b>INVOICE</b>			
ABC Widgets Ltd. Main Street Uptown 01234 567890			
date: 01-01-2011			
Item	Price	Quantity	Item Total
Gizmo	18.99	2	37.98
Dongle	45.00	1	45.00
Gadget	23.50	3	70.50
Total			153.48

Write program code to:

- accept input of the details for the invoice
- calculate the total for each item
- print each item and all its details on the invoice
- print the overall total of the invoice

Show your variable declarations and data types used.

[24]

2.
  - a) Clearly describe the differences between the compilation process and the assembly process. [5]
  - b) Outline the main differences between the USE of a compiler and the USE of an interpreter. [5]
  - c) Explain the main differences between a PROCEDURAL language and an OBJECT ORIENTED language. Name a language for EACH. [5]
  
3.
  - a) Explain why it is necessary to document programs at the various stages of development. Your answer should specifically refer to **business systems**. [5]
  - b) Explain WHY program documentation and maintenance documentation are different and give an example of an item that would appear in each but not the other. [5]
  - c) List FIVE items that would appear in USER documentation with an explanation of the purpose of EACH. [5]
  
4.
  - a) Errors may be encountered at any stage of program development. These errors come under one of three categories – SYNTAX, LOGIC or RUN-TIME. Describe the differences between them and give a meaningful example of EACH. [6]
  - b) When declaring variables in high-level languages, the programmer must state the data type for each – for example INTEGER, REAL, STRING. Explain why different data types are needed and give examples. [5]
  - c) Explain the difference between data validation and data verification, use an example for EACH. [4]
  
5. When a program is developed it needs to be tested thoroughly. Describe in detail EACH of the following, use examples to illustrate your explanations where appropriate:
  - a) Test plan
  - b) Test data
  - c) Test log [5 each]
  
6.
  - a) Most high level programming languages support at least THREE different loop constructs.
    - i Explain what a **loop** is and why it might be used. [3]
    - ii Describe TWO different types of loop and explain the **circumstances** why EACH is used. [4]
  - b) Describe TWO different decision making constructs and give a detailed example of each. [8]

*continued overleaf*

7. This question relates to **computer** screen forms NOT paper forms.  
After completing a training course the trainees are asked to complete an on-screen questionnaire to provide feedback to the training provider.
- a) List the points a programmer will need to consider when designing the screen form for this questionnaire and explain why EACH point is relevant. [5]
  - b) Draw a large rectangle to represent a screen and within it design a layout for the questionnaire – include at least THREE questions that would be appropriate in this questionnaire. [5]
  - c) Explain why you have designed your form in the way you have and with reference to features in your design, discuss the ways that these questionnaires can be evaluated and analysed after completion. [5]
8. a) High level programming languages offer several data types. Describe TWO **distinctly different** data types and give an example of EACH. [4]
- b) Explain what an **array** is and why we need arrays for data storage. Use an example to clarify your explanation. [5]
- c) A program requires entry of 10 people's names and ages from the keyboard. Write pseudocode or a program **code snippet** to show how these details would be entered and stored – NOTE you are not expected to write a full program. [6]