2012

HIGHER SCHOOL CERTIFICATE

TRIAL EXAMINATION

Software Design & Development

30% Weighting

General Instructions

- Reading time: 5 minutes
- Working time: 3 hours
- Write using **black** or **blue** pen ONLY
- Draw diagrams using **pencil**
- Write your Student Number on each page and booklet

Section I: use separate answer sheet provided

Section II: Write all answers in this booklet

Section III: Write all answers in this booklet

You will be supplied a booklet of spare paper for working out if required.

Total marks – 100

Section I [20 Marks]

- Attempt Questions 1–20
- Allow around 35 minutes for this section

Section II [60 Marks]

- Attempt Questions 21-25
- Allow around 1 hour and 50 minutes for this section

Section III [20 Marks]

- Attempt all the questions in this section
- Allow around 35 minutes for this section

Section 1: Multiple Choice

Answer this section on the answer sheet provided. Each question is worth 1 mark.

1) A _____ is a piece of code included in software as a placeholder for testing purposes.

   a) Stub
   b) Driver
   c) Flag
   d) ID Tag

2) Calculate the following from the two dimensional array given below:

   Array(2,3) + Array(0,2)

2	2	5	6
3	1	4	7
7	3	6	5
3	4	5	2

   a) 10
   b) 5
   c) 12
   d) 6

3) Software that is written for a client goes through which testing process to assure that it has met requirements?
   a) Benchmark testing
   b) System testing
   c) Program testing
   d) Acceptance testing

4) Which member of a development team assigns work and schedules?
   a) System Analyst
   b) Project Manager
   c) Programmer
   d) Networking Administrator

5) A control structure that allows a user only one choice from a list of choices is:
   a) Radio Button
   b) Check Box
   c) Selection Box
   d) Button

Use the following EBNF for question 6.

<wiffle> = at|gh|3y|9c
<waffle> = {5t|4e}
<duffle> = {<wiffle>|<waffle>}
<steve> = <wiffle>|<waffle>{*|9<duffle>}

6) Which of the following statements is correct:
   a) at4e*at
   b) 5t9c!5t
   c) gh9at*
   d) 3y*9c

7) Using public domain code and claiming it as your own is an example of:
   a) Plagiarism
   b) Pirating
   c) Copyright infringement
   d) Decompilation

8) Which of the following is NOT part of quality assurance testing:
   a) Efficiency
   b) Modularity
   c) Maintainability
   d) Testability

9) Temporary storage used in processing in the CPU are:
   a) Stacks
   b) Lists
   c) Registers
   d) Accumulators

10) During translation, code is checked for reserved words. These are:
   a) Identifiers used by the operating system
   b) Identifiers that locate memory locations
   c) Identifiers that are used internally in the language code
   d) Identifiers that are used internally as constants

11) Convert the following decimal number to binary: 137
   a) 01110111
   b) 01111011
   c) 01101011
   d) 01111101

12) The stages of the Structured Development Approach in order are:
    a) Defining, Planning, Building, Modifying
    b) Defining, Planning, Building, Testing, Modifying
    c) Planning, Building, Testing, Modifying
    d) Defining, Building, Testing, Modifying

13) A sentinel value in a program is used to:
    a) Indicate that a sub routine has ended
    b) Indicate that a value has been reached
    c) Indicate that a file has ended
    d) All of the above

14) The testing of the final solution by personnel within the development group prior to release is called:
    a) Acceptance testing
    b) Beta testing
    c) Peer checking
    d) Alpha testing

15) Testing the inputs and outputs of a module without being concerned about the processes is an example of:
    a) White box testing
    b) Black box testing
    c) Stepwise refinement
    d) System testing

16) The value 13.45 is an example of which data type?
    a) Integer
    b) Float
    c) String
    d) Boolean

17) An independent variable that gives to a command, instruction or function, the information it needs to perform an operation is called a:
    a) Parameter
    b) Variable
    c) Constant
    d) Keyword Identifier

Use the following algorithm to answer question 18 and 19:

```
A = 3
B = 8
C = 5
WHILE A < B
      C = B - A
      A = A + 1
END WHILE

Print C
```

18) What will be the output of the program?
   a) 2
   b) 1
   c) 0
   d) -1

19) How many iterations through the loop will be completed?
   a) 4
   b) 5
   c) 6
   d) 7

20) A chart that displays the allotment of time for a project is called a:
   a) Gantt chart
   b) Flow chart
   c) IPO chart
   d) Structure chart

Section 2

Answer these questions in the spaces below

Question 21 (14 Marks)

A cinema is planning a system to allow its patrons to purchase tickets on their smartphones. The application will show the closest cinemas to the user based on their phone's GPS coordinates. The app will then allow the user to select tickets, seats and candy bar items through a series of screens. Payment at the end is made using a credit card. The credit card details can be stored on the phone with the ticking of a box. Once the payment has been accepted and approved, an image is saved to the phone's camera roll with a barcode containing all of the details of the purchase.

a) Analyse two social and ethical issues that may arise from this project. [4 Marks]

b) Developing content for a phone screen is different to a computer screen. There are different considerations to be made.

Construct a screen design that would be appropriate for the project's main screen. [3 Marks]

c) Discuss TWO methods that could be used to gather feedback from users after the product has been developed. [4 Marks]

d) Discuss a development methodology that would be suitable for the completion of this project. [3 Marks]

Question 22 (14 Marks)

a) Compare and contrast interpretation and compilation as translation methods. [4 Marks]

b) List the steps and describe what occurs in the computer during each stage of the Fetch-Execute cycle. [4 Marks]

c) Discuss how parse trees are used in the compilation process. Provide an example in your answer. [3 Marks]

d) List and describe with examples the three types of errors that occur in software. [3 Marks]

Question 23 (10 Marks)

An algorithm is designed to assign a letter grade for student's exam marks. The marks are assigned a letter in 20% sections as the following table indicates:

Mark	Letter
80-100	A
60-79	B
40-59	C
20-39	D
0-19	E

The following code is written to assign the grade:

```
BEGIN assignLetterGrade(mark)
  IF mark < 20 THEN
    assign "E"
  ELSE IF mark > 20 and mark < 40 THEN
    assign "D"
  ELSE IF mark > 40 and mark < 60 THEN
    assign "C"
  ELSE IF mark > 60 and mark < 80 THEN
    assign "B"
  ELSE
    assign "A"
  END IF

  Print assign
END assignLetterGrade
```

a) Complete a desk check of the above algorithm and identify what is wrong with the algorithm. Make sure to show your selection of test data. [4 Marks]

b) Other than a desk check, list two other methods that could be used to identify errors in the code. [2 Marks]

c) Adjust and expand this algorithm in pseudocode so that it can receive a class set of marks and return grades for the entire cohort. [4 Marks]

Question 24 (11 Marks)

A developer has been creating a two-dimensional top down view roleplaying game. They have used a one-dimensional array to store the numbers of each box in the 5 by 5 grid. They have realised that their program will need to find the x and y of boxes in the grid based on the one-dimensional array. The diagram below shows the grid with its linear numbered boxes and the x and y that need to be returned by the function.

	0	1	2	3	4
0	0	1	2	3	4
1	5	6	7	8	9
2	10	11	12	13	14
3	15	16	17	18	19
4	20	21	22	23	24

a) Construct an algorithm that will return the x and y of a box in the grid based on its linear number in the array. [4 Marks]

b) Compare and contrast how a Selection and Bubble sort work. [4 Marks]

c) Compare and contrast linear searches and binary searches. Explain which is faster and use an example to justify your answer. [3 Marks]

Question 25 (11 Marks)

A company is planning to automate its inventory management. It is going to use RFID tags in each box of merchandise to track which boxes are shipped to which warehouses, and from there to each retail outlet. At each location systems are to be put in place that will automatically scan the boxes being moved on and off of trucks. When a box is unpacked at a retail outlet, the box is scanned when opened, and then each barcode is scanned as the items are removed from the box. At each point when the boxes or items are scanned, the inventory management system is updated to show the new quantity of each item in each location. Reports on inventory are then collated at the end of every week.

a) Construct a 1st level Data Flow Diagram of the above system [4 Marks]

b) Construct a Structure Chart to show the modules of how the system might be built. [4 Marks]

c) The system described above is replacing a pen and paper management system where boxes were hand counted and then reports were filed by fax.

Recommend and justify an implementation method that could be used in deploying the new system. [3 Marks]

Section III: Option Topic Programming Paradigms

Question 26 (20 Marks)

Consider the following Object Oriented code for describing opponents in a computer game.

```
Class Monster extends Opponents {

      Public {
            Int Strength;
            Int Armour;
            String Name;
            Int Health;
      }

      Private {
            Void Move();
            Void Fight();
            Void Flee();
      }
}
```

The above code is to be extended to include the Vicious Tea Pot Monster (VTPM). The VTPM has the public properties of `Water_Level` and `Tea_Type` and the private methods `Steam_Up()` and `Shout()`.

a) Compose a child class that extends from the parent Monster class to include the listed properties and methods. [3 Marks]

b) Discuss two ways in which using Object Oriented Programming can affect the programmer's productivity when completing this project. [4 Marks]

c) Compare and contrast how using Inheritance in Object Oriented Programming benefits the developer as opposed to using the Imperative paradigm. [3 Marks]

d) Describe the process of encapsulation and how it can be used to a programmer's advantage when working on large projects with many other developers. [2 Marks]

Consider the following Prolog code used to identify who works in which department and for whom:

```
employee(steve).
employee(jill).
employee(jake).
employee(paul).
employee(duncan).
employee(michelle).
employee(dwayne).
employee(lisette).
dept(accounting, steve).
dept(accounting, jill).
dept(accounting, jake).
dept(retail, paul).
dept(retail, duncan).
dept(retail, michelle).
dept(pr, dwayne).
dept(pr, lisette).
boss(duncan).
boss(dwayne).
boss(steve).

worksWith(X,Y):- dept(Z,X), dept(Z,Y).
```

e) Compose a rule that will identify if an employee is the boss of another employee. [2 Marks]

f) Bill and Steve are to be added to the program as upper management. Compose the code required to add them to the `bigBoss` group and write a rule that makes them everyone's boss. [3 Marks]

g) Describe the advantages of using the Logical Paradigm over the other paradigms we have studied in solving the problem described above. [3 Marks]

End of Examination