

Annual Examinations for Secondary Schools 2018

YEAR 10

Computing

TIME: 1h 45min

Name: _____

Class: _____

Directions to candidates:

Answer **ALL** questions in **Section A** and **Section B** on this paper;

The use of a flow chart template is permitted.

Calculators are **NOT** allowed.

Good English and orderly presentation are important.

For office use only:

QUES	1	2	3	4	5	6	7	8	9	10	11	12	13	Paper Total	Course Work	Final Mark
MAX	5	5	5	5	5	5	5	5	5	5	5	15	15	85%	15%	100%
MARK																

Section A

1. Computer programs and application packages can be found as **customisable**, **off-the-shelf** or **tailor-made**.

For each of the statements below indicate if it is **True** or **False**.

Statement	True/False	
The operating system is usually a tailor-made program:		[1]
Freeware software can be used for a limited time:		[1]
Tailor-made software are best suited for organisations that require certain personalised features:		[1]
Off-the-shelf software is usually not well documented:		[1]
Installing a software refers to the process that the end-user needs to carry out prior to running the software:		[1]

2. Technology in society has taken over in many aspects. Using the terms given below, match the most appropriate for the given scenarios: **Stock control**, **POS App**, **CAM**, **simulation** and **CAD**.



Scenarios	Term	
The process used to imitate a situation, for example blood flowing through veins:		[1]
A system that makes use of a bar code reader to aid in transaction processing:		[1]
This software converts the data of 3D designs into data that a 3D Printer understands and can therefore manufacture:		[1]
The use of computer systems to create, modify and analyse designs:		[1]
The activity of making sure that a company always has the right amount of goods available to sell:		[1]

3. Registers are hardware components which allow a small amount of temporary storage space. An example of a register is the shift register which performs arithmetic operations on the data it holds.

a. Shift the binary number **11110000** **once** to the left. [1]

--

b. Convert the answer in part (a) to decimal and mention what arithmetic operation was performed. [1]

<i>Working here</i>	<i>Answer here</i>

c. What would happen if the answer in (a) was to be stored in an 8-bit register? [1]

d. What is the result of double right shift? [1]

e. What is the minimum number of bits required to represent the days of the year? [1]

4. a. **CAL** is a very common acronym used in education. What does the acronym CAL stand for? Briefly describe CAL.

CAL:		[1]
Description:		
		[1]

- b. The **GPS** (Global Positioning System) is a computerised device very much used in travelling.



Name and **describe** another device/application used in travelling.

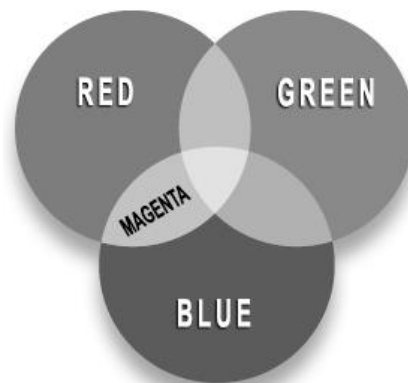
Name:		[1]
Description:		
		[1]

- c. **EFT** (electronic fund transfer) is the transfer of money from one bank to another. Briefly describe an **advantage** of EFT. [1]



5. Digital devices use hexadecimal codes to identify different colours. For example:

Colour	Code in Hex
White	FFFFFF
Black	000000
Blue	0000FF
Red	FF0000



As shown in the diagram on the right, different colours are made up as a mixture of the primary colours Red, Green and Blue. For example, if Red is mixed with Blue, Magenta is obtained.

Using the table above:

- Convert the Hexadecimal code for **red** and **blue** to **binary**.
- Add the two binary numbers for red and blue to find the binary equivalent of the colour Magenta.
- Find the hexadecimal code of Magenta, as obtained in part (b).
- To create the colour **white** on computer screens, red, blue and green are mixed together. After studying the colour codes above, what is the hexadecimal code for **green**?

Working here

a.	Red:		[1]
	Blue:		[1]
b.	Addition:		[1]
c.	Magenta in Hex:		[1]
d.	Green in Hex:		[1]

6. a. Logic gates are the building blocks for any type of electronic circuit that can manipulate the signals in binary form (0 and 1).

For example, the **NOR** gate, as shown in Figure 1, is made up of an **OR** and a **NOT** gate as shown in Figure 2. The same concept is applied for the **NAND** gate.

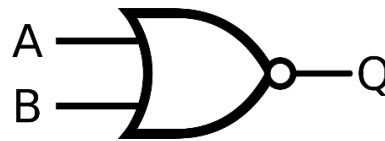


Figure 1



Figure 2

- i. Using **two** gates, represent the NAND gate. [1]

- ii. Draw the truth table for the NAND gate. [1]

iii. Extract the Boolean expression for the NAND gate. [1]

b. A company safe can only be opened ($S=1$) if:

- Two keys ($K1=1$ and $K2=1$) are used simultaneously,
- The correct pass code is entered ($P=1$)



i. Draw the truth table for the above scenario. [1]

ii. Draw the logic circuit for the truth table (scenario). [1]

7. Mrs Abela referred to a software house to create a computerised system for her company. The systems analyst informed her that apart from the program, the software house will also provide the following documentations:

- User Documentation
- Technical Documentation
- Program Documentation

a. Briefly **describe** the three types of documentation by mentioning at least **one item** found in each manual.

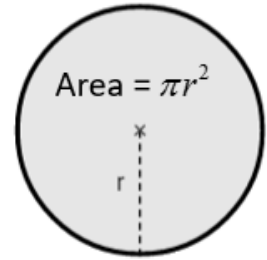
User:		[1]
Technical:		[1]
Program:		[1]

b. The technical documentation is aimed for technicians and/or end-users. For whom are the user and program documentations aimed?

User:		[1]
Program:		[1]

8. The snippet program below is used to find the area of a circle.

```
Line 1 final double PI = 3.142;  
Line 2 System.out.print("Enter radius of circle: ");  
Line 3 rad = Keyboard.readDouble();  
Line 4 double area = PI*rad;  
Line 5 System.out.println("The Area is: "+area);
```



As it is, the program has **two errors**.

a. Name the two errors together with their line numbers.

Error 1: _____ [½]
Line number: _____ [½]
Error 2: _____ [½]
Line number: _____ [½]

b. Rewrite the instructions without errors mentioned in part (a).

Error 1: _____ [1]
Error 2: _____ [1]

c. Briefly explain a **test data** that can be used to test this snippet.

Test data: _____ [1]

9. a. Represent the decimal numbers **95** and **-105** as 8-bit Twos complement binary numbers. *Show your working.*

Working here

-105₁₀ :		[1]
95₁₀ :		[1]

- b. If **A = B + C**, where **B = 95₁₀** and **C = -105₁₀** work out the value of **A** in binary and convert it to decimal to justify your answer. *Show your working.*

Working here

A (in binary):		[1]
A (in decimal):		[1]

- c. What is common among all the negative numbers represented by the 8-bit twos complement binary number system?

_____ [1]

10. Mr Grech is the owner of a supermarket, and due to the increase in clients, he wishes to expand his business. So, he referred to a systems analyst for advice with regards to digitising his business.



The list below shows some of the stages a systems analyst goes through to analyse and create a new system. For this **given scenario**, suggest some task/s that the analyst performs at each of the following stages.

- i. Project selection and feasibility study.

_____ [1]

- ii. Present system study and analysis.

_____ [1]

- iii. Design of the new computerised system.

_____ [1]

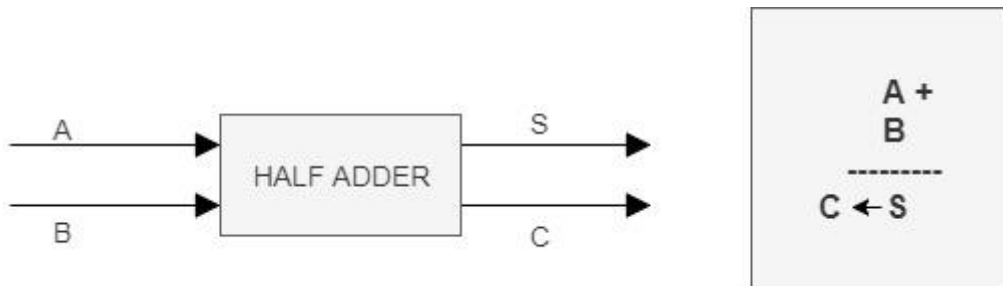
- iv. Implementation and changeover methods.

_____ [1]

- v. Control and review.

_____ [1]

11. The diagram below summarises the binary addition.



- a. The output (**S**) is the addition of **A** and **B**. Complete the below truth table. [1]

A	B	S
0	0	
0	1	
1	0	
1	1	

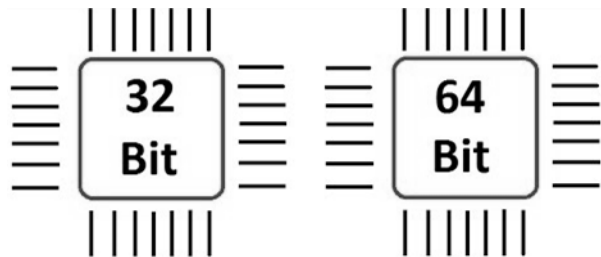
- b. Using AND, OR and NOT gates only, draw the logic circuit for the truth table obtained in (a). [3]

- c. C gives the carry bit for each addition operation. Hence, what **single** logic gate can be used to perform the carry for addition? [1]

Section B

12. In 2003, AMD brought 64-bit architecture to its microprocessors, a move Intel soon followed in 2004.

64-bit CPUs have a wider *instruction set* than 32-bit processors. Besides, 32-bit CPU architectures are based on 32-bit rather than 64-bit registers, address buses and data buses.



- a. What is a CPU's **instruction set**? [1]

- b. 64-bit processors are often preferred to their 32-bit counterparts, especially by end users who require systems with larger amounts of RAM.

Explain why, unlike a 32-bit system, a 64-bit system allows significantly more than 4GB of RAM. [1]

- c. Fill in the blanks with the appropriate bus. *The first one is given as example.*

	Address Bus	Control Bus	Data Bus
i.	A bus carrying control information between the CPU and RAM.		Control Bus
ii.	A one-way bus.		[½]
iii.	A two-way bus.		[½]

- d. For certain resource-heavy applications, a 64-bit wordlength is required. How does wordlength contribute to the performance of a computer system? [1]

- e. In a game running on a 64-bit CPU, the player is identified by his username which is stored in 16-bit Unicode character set. How many words are there if the username is 'MAX15'? [1]

- f. The CPU contains several special-purpose registers. Define special-purpose registers. [1]

- g. Fill in the blanks: [2]

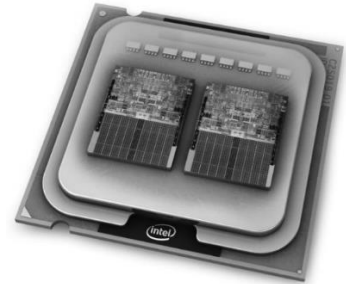
The Program Counter holds the address of the next instruction to be executed, whilst the _____ holds the instructions currently being executed by the CPU. During program execution, the ALU stores intermediate arithmetic and logic answers in the _____.

- h. Computer systems often use two's complementation for representing numeric values. [1]

What range of two's complement numbers can be represented in a 64-bit CPU?

- i. CPU performance tends to be also dependent on the amount of cache available. Briefly explain the role of cache memory in CPU performance. [1]

One other major improvement in microprocessors was the introduction of multiple cores; that is a CPU structure that encloses more than one processor. It can therefore be said that a quadcore CPU has four Arithmetic Logic Units (ALUs).



- j. What is the role of the ALU? [1]

- k. Suggest **one** advantage of having multiple cores. [1]

- l. Name **two** power-hungry applications that tend to require a particularly high-end CPU. [1]

- m. While 64-bit computing is now standard in most laptops and desktop computers, 8-bit and 16-bit processors can still be found in the modern household devices. [2]

Suggest an application for such processors. Briefly explain your answer.

13. A computer game called 'Snake' is being developed. In this game the user navigates a snake to win points.

The game rules are as follows:

- If the snake hits a **rock**, it grows smaller and loses a life;
- If the snake hits a **mouse**, it eats it and grows bigger;
- If the snake hits an **elixir**, it earns a lifepoint;
- The snake dies when its lifepoints **OR** size become 0. At this point '**Game Over**' is displayed on the screen.

- a. Part of class **Snake** is shown below:

This section of code displays the snake on the screen. The position of the snake depends on the values of variables x and y. Variable 'x' represents the horizontal axis and variable 'y' represents the vertical axis.

```
Line 1  import java.awt.*;
Line 2  import java.applet.*;
Line 3  import static java.lang.Math.random;
Line 4
Line 5  public class Snake extends Applet {
Line 6      String userName;
Line 7      int lifePoints = 3;
Line 8      int size = 5;
Line 9
Line 10     public void paint(Graphics g){
Line 11         //generate random number for x
Line 12         int x = (int)(500.0 * random()) + 1;
Line 13
Line 14         //generate random number for y
Line 15         int y = (int)(500.0 * random()) + 1;
Line 16
Line 17         for(int i=0; i<size-1; i++){
Line 18             g.drawString("*", x+i, y+i);
Line 19         }
Line 20     }
Line 21 }
```

- i. What are the initial values of the variables 'size' and 'lifePoints'?

size:		[½]
lifePoints:		[½]

- ii. Complete the code in line 12 and line 15 so that they generate a random integer from 1 to 500.

The Java library named 'awt' provides means for programmers to produce GUI features.

- iii. What do you understand by 'GUI features'? [1]

- iv. Explain the function of this line in the above code: [1]

```
import java.awt.*;
```

- b. The application also includes the methods shown below. [1]

```
...lines of code before

Line 34    public void getElixir(){
Line 35        this.lifePoints++;
Line 36    }

Line 37    public void eatMouse(){
Line 38        this.size++
Line 39    }

Line 40    public void hitRock(){
Line 41        this.lifePoints_____;
Line 42        if ((this.lifePoints > 0) ___ (this.size>0)){
Line 43            System.out.println ("I am hit!");
Line 44            System.out.println ("Snake life points: "
+ _____);
Line 45        }
Line 46        else {
Line 47            _____;
Line 48        }
Line 49    }

...lines of code after
```

- i. **Explain** what happens to the snake when the method `eatMouse()` is called. [1]

- ii. Complete method `hitRock()`. [4]

```
public void hitRock(){
    this.lifePoints_____;
    if ((this.lifePoints > 0) ____ this.size>0)){
        System.out.println ("Snake was hit!");
        System.out.println ("Snake life points:
        " + _____);
    }
    else {
        _____
    }
}
```

- c. The scope of variable 'i' in method `paint(Graphics g)` is the: [1]
- for loop
 - class Snake
 - method `paint(Graphics g)`

- d. State whether the following statements are True or False? [3]

Statement	True/False
The 'do...while' loop is a pre-tested/pre-conditioned looping construct.	
A non-void Java method can return a value to the method that calls it.	
An integer variable can hold whole numbers only.	

- e. When the game is distributed, its **user manual** will be distributed with it. Name **two** things you expect to find in the user manual. [2]
