

Annual Examinations 2017

Year 10 **COMPUTING** **MARKING SCHEME**

Section A

1. For each **application**, tick (✓) where it is **mostly** used.

		Education	Industry	Travel	
a.	Robotics:		✓		[1]
b.	CAD-CAM:		✓		[1]
c.	GPS:			✓	[1]
d.	CAL:	✓			[1]
e.	Air traffic control:			✓	[1]

2. The contents below are found in the **User**, **Technical** or **Program Documentation**.
 For each content, write the documentation it is found in.

a.	Valid types of data entry:	<i>User</i>	[1]
b.	Output screenshots:	<i>User</i>	[1]
c.	Flowcharts:	<i>Program</i>	[1]
d.	Memory requirements:	<i>Technical</i>	[1]
e.	Source code:	<i>Program</i>	[1]

3. Write **True** or **False** for each of the CPU statements below.

a.	Cycles per second refer to the speed of the CPU:	<i>True</i>	[1]
b.	With 7 bits one can represent 128 symbols:	<i>True</i>	[1]
c.	Numeric overflow usually occurs when subtracting numbers:	<i>False</i>	[1]
d.	Nano seconds are units of time measurement:	<i>True</i>	[1]
e.	MHz is greater than GHz:	<i>False</i>	[1]

4. a. Give one use of **logic gates** in computing.

Calculations (accept relevant answer)

[1]

- b. The symbol and Boolean expression of the OR gate are:

i.

Gate: OR	
Symbol	Boolean expression
	$C = A + B$

- ii. In the space below give the **name**, **symbol** and **Boolean expression** of the two other gates:

Gate: AND	
Symbol	Boolean expression
	$C = A.B$

[2]

Gate: NOT	
Symbol	Boolean expression
	$B = A'$

[2]

5. a. What is a computer **register**?

Storage locations found in the CPU that hold data temporarily

[2]

- b. i. Add the binary numbers: 101010 + 111111 + 110110.

- ii. Convert your answer to decimal.

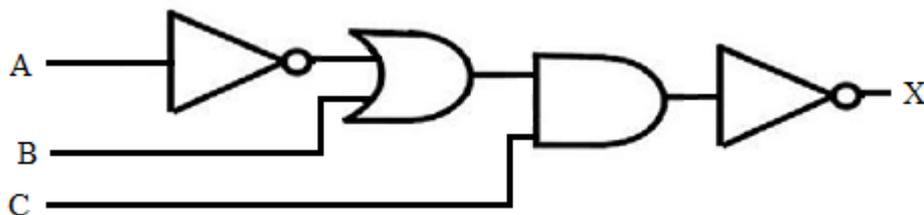
[3]

i. **Addition:** 10011111

ii. **Conversion:** 159

6. a. **10111110** and **01011111** are two 8-bit Two's complement (2C) binary numbers.
- Which one of the two numbers is negative, and why?
 - What happens if the addition of the two numbers is stored in an 8-bit register?
- i. **Negative:** 10111110 [1]
Why? MSB is 1 [1]
- ii. **Answer:** Numeric overflow [1]
- b. Convert **-111₁₀** to an 8-bit 2C binary number
-111₁₀ = 10010001 (1 mark for 2C & 1 mark for correct answer) [2]

7. Study the logic diagram below and then:
- Construct its **truth table**.
 - Extract the **Boolean expression**.



- i. **Truth table:**

A	B	C	X
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

1 mark for correct inputs and 2 marks for correct output [3]

- ii. **Boolean Expression:** $X = ((A' + B) \cdot C)'$ [2]

8. a. What is **customisable software**?

Customisable: Software written and designed to meet the client's needs, and can incorporate features from other software programs [2]

- b. Give an **advantage** and a **disadvantage** of **off-the-shelf** software.
- Advantage:** Cheaper, well documented – accept relevant answer [1]
- Disadvantage:** Too generic – accept relevant answer [1]
- c. When **installing** a program, one is usually asked to check some **system requirements**. Give one requirement which is usually asked for.
- Requirement:** RAM size – accept relevant answer [1]
9. **Run-time** error is one type of programming errors.
- When do **run-time** errors usually occur?
 - Give and briefly explain the other **two** programming errors.
 - For each error justify your answer with an **example**.
- i. **Run-time errors:** Division by zero – accept relevant [1]
- ii. **1st Error & Explanation:** Syntax with explanation [1]
- 2nd Error & Explanation:** Logical with explanation [1]
- iii. **Example of 1st Error:** Allocate 1 mark for good example [1]
- Example of 2nd Error:** Allocate 1 mark for good example [1]
10. a.
 - What is **test data**?
 - Using the Java instructions below, what suitable test data can be used to test the instructions. Justify your answer by giving a brief explanation.
- ```

for (int i =1; i < 11; i++) {
 System.out.println("Count is: " + i);
}

```
- i. **Test data:** Data used in a program to check how the program is working [1]
- ii. **Suitable test data:** Accept any relevant test data [1]
- Explanation:** Allocate 1 mark if explanation is correct to the test data [1]
- b. **Name and explain** one method which can be used to check the output of a program manually.
- Name:** Dry Run or Program Tracing [1]
- Explanation:** Allocate 1 mark if explanation is according to the name [1]
11. Fetch and execute cycle is the process by which a computer retrieves an instruction from memory, determines, and carries the necessary actions. Give the first five steps of the cycle (the last one is given).
- CU fetches the opcode from memory location indicated by PC [1]
  - CU places opcode in IR [1]
  - CU fetches any required operand [1]
  - CU increments PC to point to next instruction [1]
  - CU activates necessary circuits to execute instruction [1]
  - Go back to step 1

**Section B**

12. The CPU is at the heart of a computer system.

a. Give the term for the following CPU components. [5]

|      | Definition                                                                                                | Component Name              |
|------|-----------------------------------------------------------------------------------------------------------|-----------------------------|
| i.   | A CPU component responsible for mathematical computations and logic operations.                           | <i>ALU</i>                  |
| ii.  | A CPU component that directs all its operations.                                                          | <i>Control Unit</i>         |
| iii. | A small, temporary storage location inside the CPU that holds the instruction currently being executed.   | <i>Instruction Register</i> |
| iv.  | A CPU register that stores intermediate logic and mathematical results.                                   | <i>Accumulator</i>          |
| v.   | A small, temporary storage location inside the CPU that holds the memory address of the next instruction. | <i>Program Counter</i>      |

b. The CPU is central in determining a computer's speed. Name and briefly describe **two** things that determine CPU speed. [4]

|     | Name                                           | Description                                                              |
|-----|------------------------------------------------|--------------------------------------------------------------------------|
| i.  | <i>Clock Speed</i>                             | <i>This is the number of CPU cycles per second</i>                       |
| ii. | <i>Wordlength</i>                              | <i>The number of bits the CPU can send, receive and process at a go.</i> |
|     | <i>Accept also cache, number of cores etc.</i> |                                                                          |

c. The address bus specifies which memory location is being accessed.

i. What is the address space of a computer with a 64-bit address bus? [1]  
 $2^{64}$

ii. Explain how the width of the address bus is relevant to computer performance. [2]

- *The higher the number of lines on the address bus, the more memory locations that CPU can directly access* [1]

- *hence since the system may have a larger RAM it may work more efficiently.* [1]

d. New CPUs on the market are subjected to various benchmark tests that rate how well they perform. Name **one** feature that may lead a CPU to perform better on a benchmark test. [1]

*Higher clock speed, larger cache, larger number of cores.*

*[Accept reasonable answers]*

e. *Intel* is a tech company that names a range of its processors thus: *Core i3*, *Core i5*, *Core i7*. The *Core i7* is the higher end of the CPUs: they are more expensive but have a better performance rating. Suggest **two situations** when it would make sense to get a *Core i7*, despite the higher price. [2]

i. *High end gaming*

ii. *Video editing*

*[Accept reasonable answers]*

13. A frame-making business is computerising its ordering and billing system. The software will work out the cost of a frame: including the wooden frame round the picture and the glass covering the picture. The application has a class called Frame.

a. Suggest 2 possible properties of class Frame and state their type [2]

| Property name  | Property type |
|----------------|---------------|
| <i>length</i>  | <i>double</i> |
| <i>breadth</i> | <i>double</i> |

[accept relevant]

b. The VAT rate is being declared as a constant at 18%. Write a line of code to declare the constant VATRATE and assign it this value. [2]  
*static final double VATRATE = 0.18;*

[accept relevant]

c. Class Frame includes the following method called *findCost()*. Fill in the blanks in the code below: [2]

```
public double findCost(){
 double totalCost = this.getFrameCost() + this.getGlassCost()
 return totalCost;
}
```

d. Use the above code to deduce 2 methods in class Frame. [2]  
*this.getFrameCost(), this.getGlassCost()*

e. The method *findCostWithVAT()* will find and output the cost of a frame, including the VAT. Write this method. (Your method should include a call to method *findCost()*, which includes the cost of the frame and glass) [5]

```
public void findCostWithVat(){
 double VATcost = this.findCost() + (this.findCost() * VATRATE);
 System.out.println("The cost including VAT is: " + VATcost);
}
```

*1 mark for method declaration*

*1 mark for correct calculation of price including VAT*

*1 mark for correct output*

*1 mark for correct call to method findCost()*

*1 mark for overall functionality*

f. Distinguish between a class and an object. [2]  
 - *a class is the blueprint for many objects*  
 - *an object is an instance of a class*