



**COMPUTER SCIENCE
HIGHER LEVEL
PAPER 1**

Tuesday 16 November 2010 (afternoon)

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Section A: answer all the questions.
- Section B: answer all the questions.

SECTION A

Answer **all** the questions.

1. (a) Outline the purpose of the *systems life cycle* model. [2 marks]
(b) Identify the stage of the systems life cycle in which a feasibility report is prepared. [1 mark]
2. Draw a labelled diagram representing the basic structure of the *central processing unit* (CPU). [4 marks]
3. Customer orders are collected on paper, keyed in, and stored in the *customer orders file*. A stock *master file* is searched to determine whether sufficient stock is available and an appropriate report is produced.
Construct a *systems flowchart* representing the process described above. [5 marks]
4. Outline **one** example of *online processing*. [2 marks]
5. State **two** features to be considered when comparing the **speed** of different processors. [2 marks]
6. (a) Convert the decimal number 20.5 into binary. [2 marks]
(b) Convert the binary number 1010 1001 into hexadecimal. [1 mark]
7. Numbers can be stored in a computer in either *integer* or *floating-point representation*.
(a) State **one** reason for using floating-point representation. [1 mark]
(b) State **one** reason for using integer representation. [1 mark]
8. (a) State the register in which the results of all arithmetic operations are stored. [1 mark]
(b) Define the term *overflow error*. [2 marks]
9. State **two** types of *utility software*. [2 marks]

10. (a) State the BigO efficiency of a *binary search* algorithm. [1 mark]
- (b) State the BigO efficiency of a *bubble sort* algorithm. [1 mark]
11. Data is collected by groups of students, on a field trip, and later transferred to a central computer.
- (a) Identify **one** method of *data capture*. [1 mark]
- (b) Identify **one** method of transferring data from the field to the central computer. [1 mark]
- (c) There have been concerns about the accuracy of the data. Outline how *verification* and *validation* can be used to ensure it is as accurate as possible. [4 marks]
12. Define the term *encapsulation*. [2 marks]
13. (a) State **one** type of *interrupt*. [1 mark]
- (b) Outline the steps in the *machine instruction cycle*. [3 marks]

SECTION B

Answer *all* the questions.

- 14.** When a computer program is being developed errors may occur.
- (a) Outline **two** types of possible errors, each with a suitable example. *[4 marks]*
 - (b) Describe **three** examples of software that assist in the development of computer programs. *[6 marks]*
- 15.** (a) Draw the resultant binary search tree after the items in the following list have been inserted.
- 6, 4, 8, 3, 5, 7, 9 *[3 marks]*
- (b) State the order in which items will be listed using pre-order traversal. *[2 marks]*
 - (c) State the tree traversal that will list the items in ascending order. *[1 mark]*
 - (d) Discuss, using diagrams, how the original order of the data will affect the efficiency of searching the tree. *[4 marks]*
- 16.** A hospital has a large networked computer system. Data in the computer system is confidential.
- (a) Identify **two** ways in which the security of the network within the hospital can be ensured. *[2 marks]*
 - (b) Describe how data could be recovered in a case of corruption. *[4 marks]*
- Doctors, administrative staff and patients are permitted to access different parts of the data.
- (c) Outline how the network administrator can reduce the risk that sensitive patient data is seen by someone other than a doctor. *[4 marks]*

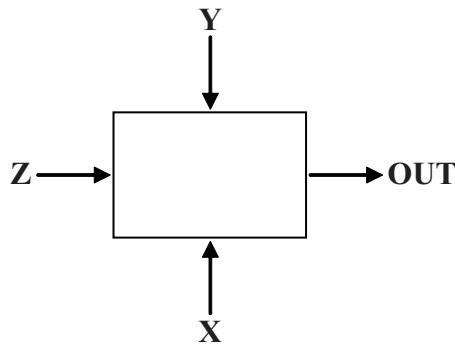
- 17. (a) (i) Define the term *recursion*. [1 mark]
- (ii) Describe **one** advantage and **one** disadvantage of recursion. [4 marks]

Examine the following recursive method.

```
public int mystery(int x, int y)
{
    if (x < y)
    { return 0; }
    else
    { return 1 + mystery(x - y, y); }
}
```

- (b) State the value of variable *w* after
 - (i) `int w = mystery(2, 3);` [1 mark]
 - (ii) `int w = mystery(2, 2);` [1 mark]
 - (iii) `int w = mystery(7, 3);` [1 mark]
- (c) Assuming that both arguments are positive, determine the purpose of the method `mystery`. [2 marks]

18. Consider the simplified logic circuit shown below. It has three inputs (**X**, **Y** and **Z**) and one output (**OUT**).



The output at **OUT** is the same as the input signal at **X** when the input signal at **Z** is 0. The output at **OUT** is the same as the input signal at **Y** when the input signal at **Z** is 1.

- (a) Construct a *truth table* that summarizes this behaviour. [3 marks]
- (b) (i) From the truth table, construct the Boolean expression for output **OUT** in terms of inputs **X**, **Y** and **Z**. [2 marks]
- (ii) Show that the expression can be simplified to $YZ + X\bar{Z}$. [2 marks]
- (c) Draw the logic circuit corresponding to the expression $YZ + X\bar{Z}$. [3 marks]

19. Consider the following program fragment.

```
int n = 8;
int p = 1;
int s = 0;
for (int c = 1; c < n; c = c + 1)
{
    if (c % 2 == 0)
    { s = s + c; }
    else
    { p = p * c; }
}
output("s = " + s);
output("p = " + p);
```

(a) Construct the trace table, started below, for the program fragment. *[3 marks]*

c	c % 2 == 0	c < 8	p	s	output

(b) Determine the purpose of the program fragment. *[2 marks]*

(c) Rewrite the program fragment, converting the **for** loop into an equivalent **while** loop. *[2 marks]*

(d) Analyse the efficiency of the program fragment. *[3 marks]*
