4341/01

COMPUTER SCIENCE

UNIT 1: Understanding Computer Science

A.M. WEDNESDAY, 3 June 2015

1 hour 30 minutes plus your additional time allowance

Surname _____

Other Names _____

Centre Number _____

Candidate Number 0 _____

FOR EXAMINER'S USE ONLY	
TOTAL	

INSTRUCTIONS TO CANDIDATES

Use black ink, or black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

If you run out of space, use the continuation pages at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

Quality of written communication will be assessed in question 13.

Answer ALL questions.

1.   **TICK (✓) the correct boxes below to show which FOUR of the following items are usually found on the CENTRAL PROCESSING UNIT (CPU) of a personal computer.   [4]**

Hard disk drive ☐

Controller ☐

RAM ☐

Internal memory ☐

Arithmetic Logic Unit (ALU) ☐

BIOS ☐

Registers ☐

ROM ☐

2. **(a)** **Complete the table opposite comparing the typical uses of DIFFERENT frequently used BACKING STORAGE.**

The FIRST ROW has been completed for you. [3]

2(b) **In the table below, put the different backing storage from 2(a) in order of ACCESS SPEEDS. Put the fastest first.** **[1]**

Fastest ⟶ **Slowest**

BACKING STORAGE 1	BACKING STORAGE 2	BACKING STORAGE 3	BACKING STORAGE 4

BACKING STORAGE	TYPICAL USE (SUITABILITY)
Compact Disc	Storing and transferring music files or photographs
	Moving small files from work to home
External hard drive	
	Backing up a large commercial server

3. **A large comprehensive school has over 500 computers connected to their LOCAL AREA NETWORK (LAN) with a connection to the Internet.**

   (a) **Describe, IN DETAIL, FOUR DISADVANTAGES for the school of having a network of computers compared to stand alone computers.   [8]**

   DISADVANTAGE 1 _____

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   _____

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   DISADVANTAGE 2 _____

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DISADVANTAGE 3 ———————————————————————

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DISADVANTAGE 4 ———————————————————————

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3(b) **All staff and pupils have a unique USERNAME and a PASSWORD to access the network.**

State THREE rules that should apply to users' passwords to reduce the possibility of someone guessing a password.   [3]

RULE 1 _____

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RULE 2 _____

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RULE 3 _____

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3(c) All pupil and staff files are stored on servers located in a secure server room.

    (i) Describe the USER ACCESS LEVELS pupils should be given for their own files.   [1]

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    (ii) Describe the USER ACCESS LEVELS that should be given for files a teacher wants pupils to view, such as a homework task. [1]

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4. **Opposite is an algorithm that uses GLOBAL and LOCAL variables.**

(a) **Write down an example of a GLOBAL VARIABLE and a LOCAL VARIABLE from the algorithm above.**

GLOBAL VARIABLE

_____

_____

LOCAL VARIABLE

_____

_____

```
Algorithm FindTotal

Num1 is integer      {number input by user}
Num2 is integer      {number input by user}

    declare subprocedure AddTwoNum
    {procedure to find the total of two integers}

    Total is integer      {used to store the answer}

    start
        set Total = Num1 + Num2
        output "the total is", Total
    end

startmainprog

    output "type in first number"
    input Num1
    output "type in second number"
    input Num2
    call AddTwoNum

endmainprog
```

4(b) **Explain the difference between global and local variables.   [2]**

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5. **Computer programs require TRANSLATION to execute.**

(a) **COMPILERS and INTERPRETERS translate high level programming languages into machine code. Describe the main differences between a compiler and an interpreter. [4]**

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5(b) State the main difference between an ASSEMBLER and both a compiler and an interpreter.   [1]
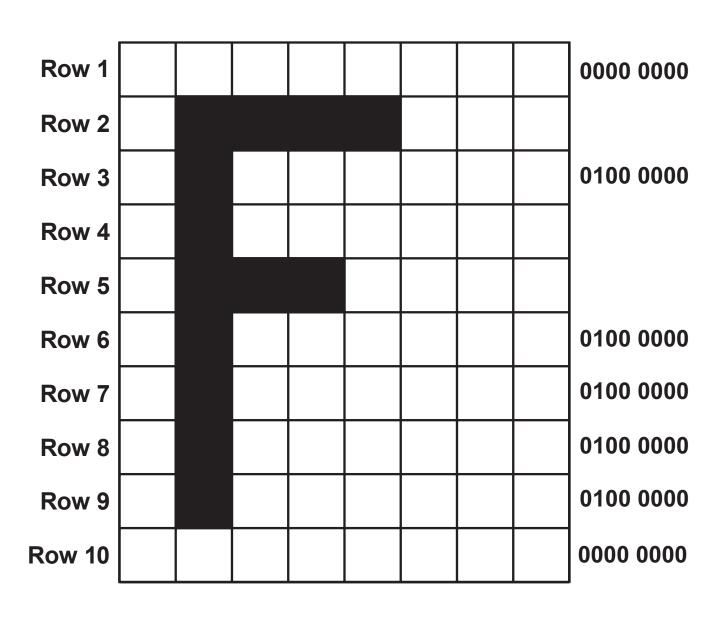
_____

_____

_____

_____

6. Opposite is a representation of a black and white bitmap image consisting of 10 ROWS and 8 COLUMNS of pixels. The data for each pixel is stored as one bit with 0 representing white and 1 representing black.

The data about the pixels in each row is shown on the right hand side of each row.

(a) Write down the DATA for Rows 2, 4 and 5.

ROW 2 _____

[1]

ROW 4 _____

[1]

ROW 5 _____

[1]

(b) State the number of bytes required to store the data for ONE row. **[1]**

_____

_____

Row 1									0000 0000
Row 2									
Row 3									0100 0000
Row 4									
Row 5									
Row 6									0100 0000
Row 7									0100 0000
Row 8									0100 0000
Row 9									0100 0000
Row 10									0000 0000

6(c) State the number of bytes required to store the data for the WHOLE PICTURE.   [1]

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(d)   (i) A DIFFERENT image uses colour and each pixel can be one of 256 colours. State the number of bytes required to store the data for ONE pixel.   [1]

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6(d) **(ii)** **Calculate the number of bytes required to store the data for the WHOLE picture opposite page 16 if it was a colour image with each pixel having 256 colours. You must show your workings.** **[2]**

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7(a) **One facility of a SOFTWARE DEVELOPMENT ENVIRONMENT is to convert source code to machine code.**

Name and briefly describe FOUR other facilities commonly found in a Software Development Environment.   [8]

FACILITY 1 _____

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FACILITY 2 _____

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FACILITY 3 ———————————————————

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FACILITY 4 ———————————————————

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7(b) **Give TWO examples of PRIVATE FUNCTIONS or SUBPROGRAMS commonly stored in a programming library.   [2]**

EXAMPLE 1 _____

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_____

EXAMPLE 2 _____

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_____

8(a) Complete the truth table opposite, for the logical AND operation, by writing 0 or 1 in the last column. THE FIRST ROW HAS BEEN COMPLETED FOR YOU.   [3]

(b) Below are three 8-bit registers labelled A, B and C.

Carry out a logical AND operation on the bits in the registers A and B and write the result in register C.   [2]

A	0	0	0	1	1	0	1

B	0	0	0	0	0	0	1

C							

A	B	A AND B
0	0	0
0	1	
1	0	
1	1	

8(c) **Describe the result produced in register C of performing a logical AND operation using the bit pattern in register B on any bit pattern in register A.**

[2]

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9. **Identify and describe FOUR roles of the operating system when managing the resources of a personal computer.   [8]**

   ROLE 1 _____

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   ROLE 2 _____

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ROLE 3 _____

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ROLE 4 _____

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10. **Opposite is an algorithm.**

Write down ALL the outputs in the correct order produced by the algorithm.   [3]

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Total is integer        {stores the total of the numbers input}
Mean is real            {stores the mean of the numbers input}
i is integer            {stores the loop control value}

startmainprog

    set Total = 0       {initialise variable}

    for i = 1 to 5

        set Total = Total + i

        output "Total is ", Total

    next i

    set Mean = Total / 5

    output "Mean is ", Mean

endmainprog
```
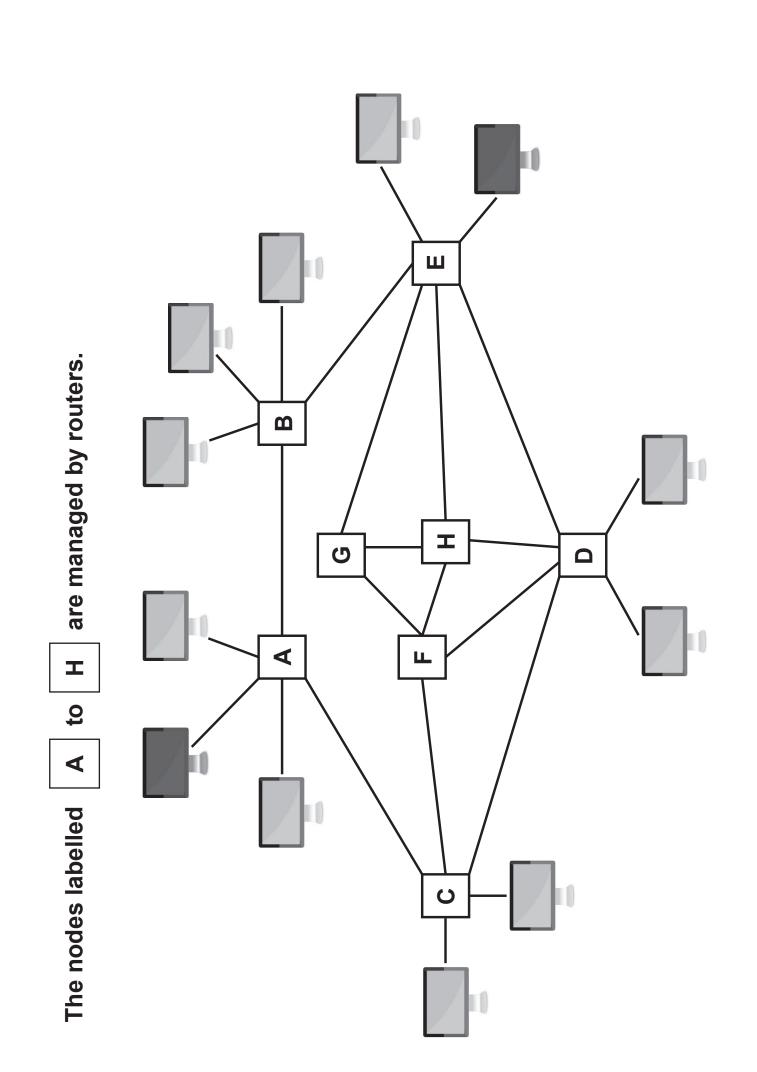
11. Computer programs sometimes contain errors.

Name THREE DIFFERENT types of error that could occur in a computer program. Give an example of EACH type of error. [6]

ERROR 1 _____

_____

EXAMPLE _____

_____

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ERROR 2 _____

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EXAMPLE _____

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ERROR 3 ———————————————————————

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EXAMPLE ———————————————————————

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12(a) Convert the denary number 212 to a binary number with 8 bits.   [2]

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(b)   Convert the denary number 212 to hexadecimal.

[2]

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12(c) Convert the hexadecimal number 2F to denary.   [2]

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13. Opposite is a diagram of a WIDE AREA NETWORK (WAN) such as the internet.

Data is transmitted on this WAN using PACKET SWITCHING.

Describe how data might be transmitted on this network, explaining:

- how PACKET SWITCHING and ROUTING operates;

- the contents of a PACKET;

- the benefits of transmitting packets using routers.   [12]

QUALITY OF WRITTEN COMMUNICATION WILL BE ASSESSED IN THIS QUESTION.

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The nodes labelled A **to** H **are managed by routers.**

END OF PAPER

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Additional page, if required.
Write the question numbers in the left-hand margin.

Question number	Additional page, if required. Write the question numbers in the left-hand margin.