Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

8669983605

COMPUTER SCIENCE **9608/12**

Paper 1 Theory Fundamentals **October/November 2015**

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
No marks will be awarded for using brand names of software packages or hardware.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The maximum number of marks is 75.

This document consists of **14** printed pages and **2** blank pages.

CAMBRIDGE International Examinations

1 **(a)** Give **three** differences between Dynamic RAM (DRAM) and Static RAM (SRAM).

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.....[3]

(b) **(i)** Examples of primary and secondary storage devices include:

- hard disk
- DVD-RW
- flash memory

For each device, describe the type of media used.

Hard disk .....

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DVD-RW .....

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Flash memory .....

.....[3]

(ii) Describe the internal operation of the following devices:

DVD-RW .....

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DVD-RAM .....

.....[2]

2 **(a)** Describe how a laser mouse operates.

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.....[3]

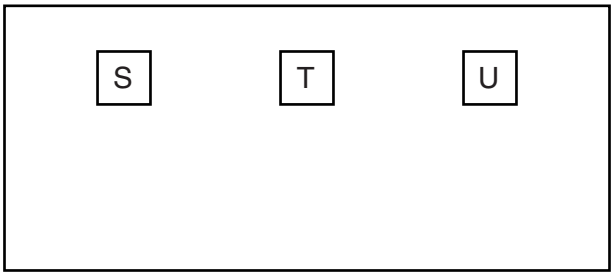
(b) The following table shows a list of five statements which describe the stages when a page is printed using an inkjet printer.

Put each statement in the correct sequence by writing the numbers 1 to 5 in the right-hand column.

Statement	Sequence number
Paper feed stepper motor activated; sheet of paper fed from paper tray	
Printer driver translates data into a suitable format for the printer	
The print head moves across the page; ink is sprayed each time the print head pauses for a fraction of a second	
Paper feed stepper motor advances paper a fraction of a cm after each complete head pass	
Printer receives data from the computer and stores the data in the printer's buffer	

[5]

3 A touch screen has three squares where a selection can be made:



(a) The x-coordinate of the centre of the three squares is held in three memory locations:

	Address	Memory contents
S	40	0000 1011 0100
T	41	0010 0101 0100
U	42	0100 0110 1100

(i) Give the hexadecimal value of the memory contents for U.

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.....[1]

(ii) Convert the denary number 40 into binary.

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.....[1]

(b) Bitmap graphics are used to represent squares S, T and U.

These can be saved in a number of different image resolutions.

(i) Give the number of bits required to store each pixel for a black and white bitmap.

.....[1]

(ii) Identify how many bits are required to store each pixel for a 256-colour bitmap.

Explain your answer.

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.....[2]

(c) Images can be compressed to reduce file size.

(i) Describe how lossless compression techniques work.

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.....[2]

(ii) Describe how lossy compression techniques work.

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.....[2]

4 **(a)** Sound can be represented digitally in a computer.

Explain the terms sampling resolution and sampling rate.

Sampling resolution .....

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Sampling rate .....

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.....[4]

(b) The following information refers to a music track being recorded on a CD:

- music is sampled 44 100 times per second
- each sample is 16 bits
- each track requires sampling for left and right speakers

(i) Calculate the number of bytes required to store one second of sampled music. Show your working.

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.....[2]

(ii) A particular track is four minutes long.

Describe how you would calculate the number of megabytes required to store this track.

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.....[2]

(c) When storing music tracks in a computer, the MP3 format is often used. This reduces file size by about 90%.

Explain how the music quality is apparently retained.

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.....[3]

5 Bobby is a senior programmer at a software house which produces intruder detection software. He also runs his own software company which develops and sells various computer applications.

The following table shows seven activities which Bobby carries out.

Put a tick (✓) in the appropriate column to identify if the activity is ethical or unethical.

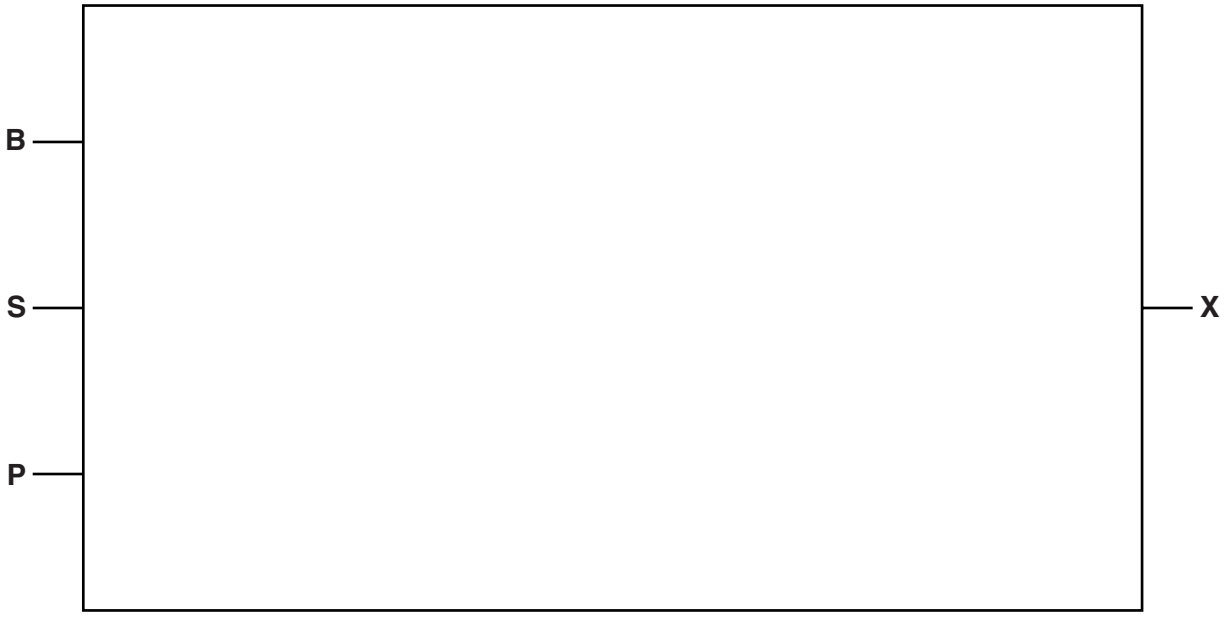
Activity	Ethical	Unethical
gives away passwords used in the intruder detection software		
uses source code developed at the software house for the software he develops for his own company		
insists that staff work to deadlines		
turns down training opportunities offered by his employer		
writes and sells software that reads confidential data from client computers		
fakes test results of safety-critical software		
has the software applications developed overseas for sale in his own country		

[7]

6 **(a)** A student wrote the following logic statement:

X is 1 if (B is NOT 1 AND S is NOT 1) OR (P is NOT 1 AND S is 1)

Draw a logic circuit to represent the above logic statement.



[6]

(b) Complete the truth table for this system.

B	S	P	Working space	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

7 **(a)** The string of characters, “BINARY CODE”, was transmitted using 11 bytes of data. An additional byte, called the parity byte, was also transmitted.

Parity bytes can be used to identify exactly which bit has been transmitted incorrectly.

The table shows bit patterns for all 12 bytes after transmission. Even parity was used and the first bit is the parity bit.

	character	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7	bit 8
byte 1	B	0	1	0	0	0	0	1	0
byte 2	I	1	1	0	0	1	0	0	1
byte 3	N	0	1	0	0	1	1	1	0
byte 4	A	0	1	0	0	0	0	0	1
byte 5	R	1	1	0	1	0	0	1	0
byte 6	Y	0	1	1	1	1	0	0	1
byte 7		1	0	1	0	0	0	0	0
byte 8	C	1	1	0	0	0	0	1	1
byte 9	O	1	1	0	0	1	1	1	1
byte 10	D	0	1	0	0	0	1	0	0
byte 11	E	1	1	0	0	0	1	0	1
parity byte		0	0	1	0	0	0	1	0

(i) There is one error in the transmission.

Indicate the byte number and bit number of the bit which has been incorrectly transmitted.

Byte number .....

Bit number .....[2]

(ii) Explain your answer to **part (i)**.

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.....[2]

(b) Verification and validation can be applied during data entry.

Describe what is meant by these terms. For each method, explain why it is needed.

Verification .....

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Validation .....

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.....[4]

8 The table shows assembly language instructions for a processor which has one general purpose register – the Accumulator (ACC).

Instruction		Explanation
Op code	**Operand**	
LDD	<address>	Direct addressing. Load the contents of the given address to ACC
LDX	<address>	Index addressing. Form the address from <address> + the contents of the index register. Copy the contents of this calculated address to ACC
LDI	<address>	Indirect addressing. The address to be used is at the given address. Load the contents of this second address to ACC
STO	<address>	Store the contents of ACC at the given address
INC	<register>	Add 1 to contents of the register (ACC or IX)
ADD	<address>	Add the contents of the given address to the ACC
END		Return control to the operating system

The diagram shows the contents of the memory:

main memory

100	0000 0010
101	1001 0011
102	0111 0011
103	0110 1011
104	0111 1110
105	1011 0001
106	0110 1000
107	0100 1011
↓	↓
200	1001 1110

(a) (i) Show the contents of the Accumulator after execution of the instruction:

LDD 102

Accumulator: | | | | | | | | |

[1]

(ii) Show the contents of the Accumulator after execution of the instruction:

LDX 101

Index register:	0	0	0	0	0	1	0	0
Accumulator:								

Explain how you arrived at your answer.

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.....[3]

(iii) Show the contents of the Accumulator after execution of the instruction:

LDI 103

Accumulator:								

Explain how you arrived at your answer.

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.....[4]

(b) Trace the assembly language program using the trace table.

```
800    LDD    810
801    INC
802    STO    812
803    LDD    811
804    ADD    812
805    STO    813
806    END
810    28
811    41
812    0
813    0
```

Trace table:

Accumulator	**Memory address**			
	810	811	812	813
	28	41	0	0

[6]

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