Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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7096669405

COMPUTER SCIENCE **9608/13**

Paper 1 Theory Fundamentals **May/June 2017**

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.

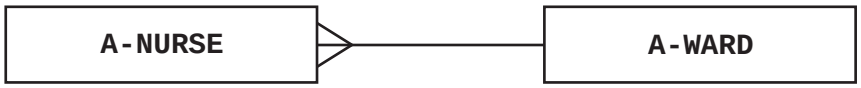
This document consists of **15** printed pages and **1** blank page.

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1 A hospital is divided into two areas, Area A and Area B. Each area has several wards. All the ward names are different.

A number of nurses are based in Area A. These nurses always work on the same ward. Each nurse has a unique Nurse ID of `STRING` data type.



(a) Describe the relationship shown above.

.....

.....[1]

(b) A relational database is created to store the ward and nurse data. The two table designs for Area A are:

`A-WARD(WardName, NumberOfBeds)`

`A-NURSE(NurseID, FirstName, FamilyName, .....)`

(i) Complete the design for the `A-NURSE` table. [1]

(ii) Explain how the relationship in **part (a)** is implemented.

.....

.....

.....

.....[2]

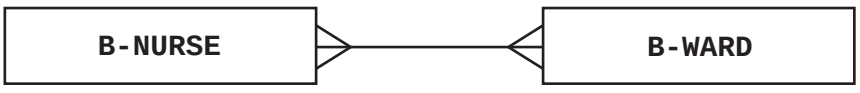
(c) In Area B of the hospital, there are a number of wards and a number of nurses.

Each Area B ward has a specialism.

Each Area B nurse has a specialism.

A nurse can be asked to work in any of the Area B wards where their specialism matches with the ward specialism.

The relationship for Area B of the hospital is:



(i) Explain what the degree of relationship is between the entities `B-NURSE` and `B-WARD`.

.....

.....[1]

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(ii) The design for the Area B data is as follows:

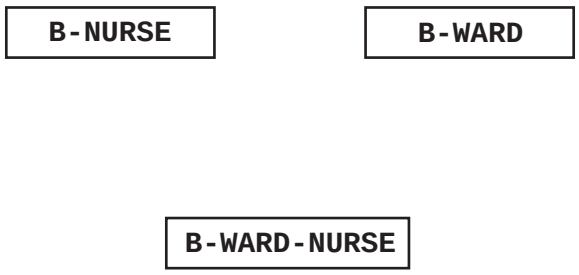
B-NURSE(NurseID, FirstName, FamilyName, Specialism)

B-WARD(WardName, NumberOfBeds, Specialism)

B-WARD-NURSE(.....)

Complete the attributes for the third table. Underline its primary key. [2]

(iii) Draw the relationships on the entity-relationship (E-R) diagram.



[2]

(d) Use the table designs in **part (c)(ii)**.

(i) Write an SQL query to display the Nurse ID and family name for all Area B nurses with a specialism of 'THEATRE'.

.....

.....

.....[3]

(ii) Fatima Woo is an Area B nurse with the nurse ID of 076. She has recently married, and her new family name is Chi.

Write an SQL command to update her record.

UPDATE .....

SET .....

WHERE .....

[3]

2 **(a)** **(i)** The following sequence of steps (1 to 7) describe how a single page is printed on a laser printer.

The statements A, B, C and D are used to complete the sequence.

A	The paper passes through a fuser, which heats up the paper. The toner melts and forms a permanent image on the paper.
B	The electrical charge is removed from the drum and the excess toner is collected.
C	The image is converted on the drum into an electrostatic charge.
D	The oppositely-charged paper picks up the toner particles from the drum. After picking up the toner, the paper is discharged to stop it clinging to the drum.

Complete the sequence by writing one of the letters **A**, **B**, **C** or **D** on the appropriate row.

1. A laser beam and a rotating mirror are used to draw an image of the page on the photosensitive drum.
2. .....
3. Electrostatic charge attracts toner.
4. The charged paper is rolled against the drum.
5. .....
6. .....
7. ..... [3]

(ii) A computer user has a laser printer to print letters and documents. The user also prints digital photographs taken using a digital camera.

State the most suitable type of printer for printing the photographs.

.....[1]

(b) The user is considering the purchase of a new laptop computer. She has read many product reviews and knows that there are different types of internal secondary storage available.

List **two** options for internal secondary storage.

Option 1 .....

Option 2 .....

Describe **one** advantage of one of the options.

Advantage of choosing option 1 / 2 *(circle)*

.....

.....[3]

Question 3 begins on page 6.

3 **(a)** A computer has a microphone and captures a voice recording using sound recording software.

Before making a recording, the user can select the sampling rate.

Define the term **sampling rate**. Explain how the sampling rate will influence the accuracy of the digitised sound.

Sampling rate .....

.....

.....

Explanation .....

.....

[2]

(b) The computer also has bitmap software.

(i) Define the terms **pixel** and **screen resolution**.

Pixel .....

.....

Screen resolution .....

.....

[2]

(ii) A picture has been drawn and is saved as a monochrome bitmap image.

State how many pixels are stored in one byte.

.....[1]

(iii) A second picture has width 2048 pixels and height 512 pixels. It is saved as a 256-colour image.

Calculate the file size in kilobytes.

Show your working.

.....

.....

.....

.....

.....

.....[3]

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(iv) The actual bitmap file size will be larger than your calculated value.

State another data item that the bitmap file stores in addition to the pixel data.

.....

.....[1]

4 The following table shows part of the instruction set for a processor. The processor has one general purpose register, the Accumulator (ACC) and an Index Register (IX).

Instruction			Explanation
Op code (mnemonic)	**Operand**	**Op code (binary)**	
LDM	#n	0000 0001	Immediate addressing. Load the denary number n to ACC.
LDD	<address>	0000 0010	Direct addressing. Load the contents of the location at the given address to ACC.
LDI	<address>	0000 0101	Indirect addressing. At the given address is the address to be used. Load the contents of this second address to ACC.
LDX	<address>	0000 0110	Indexed addressing. Form the address from <address> + the contents of the Index Register (IX). Copy the contents of this calculated address to ACC.
LDR	#n	0000 0111	Immediate addressing. Load number n to IX.
STO	<address>	0000 1111	Store the contents of ACC at the given address.

The following diagram shows the contents of a section of main memory and the Index Register (IX).

(a) Show the contents of the Accumulator (ACC) after each instruction is executed.

IX	0	0	0	0	0	0	1	1

(i) `LDM #500`

ACC .....[1]

(ii) `LDD 500`

ACC .....[1]

(iii) `LDX 500`

ACC .....[1]

(iv) `LDI 500`

ACC .....[1]

Address	Main Memory contents
495	13
496	86
497	92
498	486
499	489
500	496
501	497
502	499
503	502

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(b) Each machine code instruction is encoded as 16-bits (8-bit op code followed by an 8-bit operand).

Write the machine code for the following instructions:

```
LDM #17
```


```
LDX #97
```


[3]

(c) Using an 8-bit operand, state the maximum number of memory locations, in denary, that can be directly addressed.

.....[1]

(d) Computer scientists often write binary representations in hexadecimal.

(i) Write the hexadecimal representation for this instruction:

0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	0

.....[2]

(ii) A second instruction has been written in hexadecimal as:

```
05 3F
```

Write the equivalent assembly language instruction, with the operand in denary.

.....[2]

5 A computer receives data from a remote data logger. Each data block is a group of 8 bytes. A block is made up of seven data bytes and a parity byte.

Each data byte has a parity bit using odd parity. The parity byte also uses odd parity.

The following table shows a data block before transmission. Bit position `0` is the parity bit.

Bit position							
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1	1	0	0	1	1	0	1
0	0	1	0	0	0	0	0
1	0	0	1	1	1	0	**A**
1	1	0	0	0	0	1	0
1	1	0	0	0	0	1	0
1	1	0	0	0	1	1	**B**
0	0	0	0	0	0	0	0

Data bytes

0	1	1	0	1	1	0	0

← Parity byte

(a) (i) Describe how the data logger calculates the parity bit for each of the bytes in the data block.

.....

.....

.....[2]

(ii) State the two missing parity bits labelled **A** and **B**.

A = ...

B = ... [1]

(iii) Describe how the computer uses the parity byte to perform a further check on the received data bytes.

.....

.....

.....[2]

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(b) (i) A second data block is received as shown in the following table. There are errors in this data block.

Identify and then circle **two** bits in the table which must be changed to remove the errors.

Bit position							
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1	0	0	0	1	1	0	0
0	0	1	0	0	0	0	0
0	0	1	1	0	1	0	1
1	1	1	1	0	0	0	1
1	1	0	0	0	0	1	0
0	0	1	0	0	1	0	0
0	0	0	0	0	0	0	1

0	1	0	1	1	0	0	0

[2]

(ii) Explain how you arrived at your answers for **part (b)(i)**.

.....

.....

.....

.....[3]

6 **(a)** The operating system (OS) contains code for performing various management tasks.

The appropriate code is run when the user performs various actions.

Draw a line to link each OS management task to the appropriate user action.

OS management task	Action
Main memory management	The user moves the mouse on the desktop
Input/Output management	The user closes the spreadsheet program
Secondary storage management	The user selects the Save command to save their spreadsheet file
Human computer interface management	The user selects the Print command to output their spreadsheet document

[3]

(b) A user has the following issues with the use of his PC.

State the utility software which should provide a solution.

(i) The hard disk stores a large number of video files. The computer frequently runs out of storage space.

Utility software solution .....[1]

(ii) The user is unable to find an important document. He thinks it was deleted in error some weeks ago. This must not happen again.

Utility software solution .....[1]

(iii) The operating system reports 'Bad sector' errors.

Utility software solution .....[1]

(iv) There have been some unexplained images and advertisements appearing on the screen. The user suspects it is malware.

Utility software solution .....[1]

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7 The design of a web-based application can require the use of client-side scripting.

(a) Describe what is meant by **client-side scripting**.

.....

.....

.....

.....[2]

(b) A user requests a web page by keying the Uniform Resource Locator (URL) into the address bar of their web browser.

The requested page contains a client-side script.

Describe the sequence of steps leading to the display of the web page on the computer screen.

.....

.....

.....

.....

.....

.....

.....

.....[4]

(c) A web page used for data capture consists of:

- two text boxes for the entry of:
  - a product code
  - the number of items to be purchased.
- a button which is clicked when the user wants to submit this order.



Study the following web page.

```
<html>
<head>
<title>Untitled Document</title>
<script language="JavaScript">

function myButton_onmousedown()
{
var Message1 = "ERROR - Order refused";
var Message2 = "Product code OK";
var x = document.forms["form1"]["txtProductCode"].value;
    if (x == "")
    {
        alert(Message1)
    }
    else
    {
        alert(Message2)
    }
}
</script>

</head>
<body>
<form name = form1>
  <label>Product code: </label>
  <input type="text" name="txtProductCode" >
  <label>Number: </label>
  <input type="text" name="txtNumber" size = "5" >
  <p>
    <label>Submit order: </label>
    <input type="button" name="btnSubmit" Value = "Submit"

    onMouseDown = "myButton_onmousedown()" >
  </p>
</form>

</body>
</html>
```

(i) The developer has used three variables in the JavaScript code. State the identifiers used.

1 .....

2 .....

3 ..... [2]

(ii) The button has an event whose identifier is `onMouseDown`. When the submit button is clicked, some code is executed.

State the line numbers that contain this code.

From line ..... to line ..... [1]

(iii) The JavaScript code uses a selection statement.

State the line number that contains the condition.

Line number: ..... [1]

(iv) Describe the purpose of the validation check that the code performs.

.....

.....[1]

(v) Name and describe **two** other types of validation check that could be appropriate for this data capture form.

Validation check: .....

Description .....

.....

Validation check: .....

Description .....

.....
[4]

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