Surname		Other Names	
Centre Number			Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Education
June 2007
Advanced Subsidiary Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

COMPUTING **CPT1**
Unit 1 Computer Systems, Programming and Networking Concepts

Tuesday 22 May 2007 9.00 am to 10.30 am

You will need no other materials.
You may use a calculator.

Time allowed: 1 hour 30 minutes

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Show all your working.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The maximum mark for this paper is 65.
- The marks for questions are shown in brackets.
- The use of brand names in your answers will **not** gain credit.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use			
Question	Mark	Question	Mark
1		5	
2		6	
3		7	
4			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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Answer **all** questions in the spaces provided.

1 (a) Define the term software. .....

.....

(1 mark)

(b) **Table 1** shows a list of software types with an example.

Complete the entries in the table. All entries **must be different**.

Table 1

Software category	Example
Programming language translator	(i) .....
(ii)	Disk defragmenter
(iii)	A DLL file that is used by several applications programs
General purpose applications program	(iv) .....

(4 marks)

5

2 (a) Writing program code requires the programmer to use identifiers for variables and procedures.

(i) State **two** other uses for identifiers.

1 .....

2 .....

(2 marks)

(ii) Most programming languages impose restrictions or rules about what is and is not allowed for identifier names. State **one** such rule.

.....

(1 mark)

(b) Program code is often written with the use of procedures. Describe **one** reason why a programmer would decide to use procedures.

.....

.....

(1 mark)

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(c) A programmer-written function **SearchThisArray** is defined as follows.

```
SearchThisArray(ThisArray : Array[1..10] Of String;
                                ThisString : String) : Integer ;
```

The function searches the array **ThisArray** for the value **ThisString**.

If an exact match is found, the function returns the index position in ThisArray.
If not found, the function returns -1.
If the function's arguments, ThisArray and ThisString are illegally formed, the function returns -2.

The function is used in a program with the statements shown below and uses the data shown in the Customer array in **Figure 1**.

Figure 1

Index (Subscript)	Customer
[1]	Weeks
[2]	Adamson
[3]	Patel
[4]	Berkovic
[5]	Ince
[6]	Neale
[7]	Williamson
[8]	Collins
[9]	Davis
[10]	Beckham

What is the value returned to variable Result in each case?

(i) `Result := SearchThisArray(Customer, 'Beckham')`

Value of Result .....

(1 mark)

(ii) `Result := SearchThisArray(Customer, 'Williams')`

Value of Result .....

(1 mark)

6

Turn over ▶

3 A county has a number of local libraries in various towns. Books currently belong to each library and there is no system for the exchange of books between libraries.

Each library has a local area network (LAN) for lending and enquiries shown in **Figure 2**.

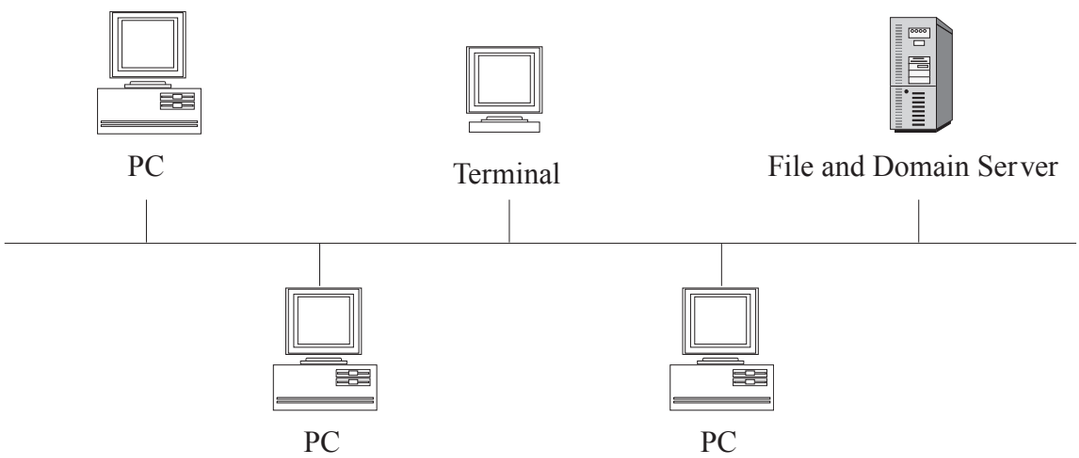
(a) (i) Describe what is meant by a local area network.

.....

.....

(2 marks)

Figure 2



(ii) What type of local area network topology is shown in **Figure 2**?

.....

(1 mark)

(iii) Does the network cable for this type of network use serial or parallel transmission of data?

.....

(1 mark)

(iv) Name **one** other type of local area network topology.

.....

(1 mark)

(v) Name **two** other devices which could be added to the network each of which would be a resource shared by users (administrators and/or borrowers) of the network.

1 .....

2 .....

(2 marks)

(b) There is currently an Internet connection from one of the PCs, and staff use this to contact a book supplier by keying the following into the address bar of the browser software.

http://www.bargainbooks-r-us.co.uk/index.htm

(i) What is the **domain name** of the supplier?

.....

(1 mark)

(ii) What is **index.htm**?

.....

(1 mark)

(iii) Sometimes when the browser is used the software displays the error message 'Page Not Found'.

Give **one** possible reason for this, other than a misspelling of the URL.

.....

.....

(1 mark)

(c) The decision has been made to connect each library to a wide area network.

(i) Explain what is meant by a wide area network (WAN).

.....

.....

(2 marks)

(ii) Describe **two** benefits of connecting all the libraries to a WAN. **One** should be a benefit for a library administrator, and **one** a benefit for a borrower.

1 Administrator .....

.....

2 Borrower .....

.....

(2 marks)

14

Turn over ▶

4 This question continues with the library service scenario from Question 3. New programs have to be written, as the decision has been made to have centralised records of library books.

The software house commissioned to write the new programs has obtained a complete list of titles held at each library. It found that a common system was used for the book codes. Some older books will not be retained and this is to be indicated by the `ToBeRetained` column in **Table 2**.

Table 2

BookTitle	BookCode	YearFirstInStock	ToBeRetained
Hang-gliding made simple	T05320	1993	
Around the world in 80 days	T76542	2001	
My way	M11981	1990	
Starting with hypnotherapy	M79080	2005	
Kim Smith – the autobiography	M00876	1991	
XXX			

(a) Study the sample data shown in **Table 2**. This data will be accessed by program code. Name the most suitable **data type** which should be used for each data item. Each data type **must be different**.

(i) `BookCode` .....

(1 mark)

(ii) `YearFirstInStock` .....

(1 mark)

(iii) `ToBeRetained` .....

(1 mark)

(b) The first application to be developed is a program to search the complete list of books and to calculate the data values for the `ToBeRetained` column; any books which were bought before 1992 will not be retained.

The incomplete pseudo-code which follows shows a first attempt at the algorithm. Data for each of the four attributes `BookTitle, BookCode, YearFirstInStock, ToBeRetained` are shown in the table in **Table 2**, and are to be stored in four arrays `BookTitle, BookCode, YearFirstInStock` and `ToBeRetained`.

Complete the pseudo-code in the **three** places indicated.

```
For Book ← 1 To TotalNoOfBooks
  If YearFirstInStock[ (i) ..... ] < 1992
     Then ToBeRetained[Book] ←(ii) .....
     Else ToBeRetained[Book] ←(iii) .....
  EndIf
EndFor
```

(3 marks)

(c) A second program is to be developed to allocate each book a new code number. The old book codes are to be abandoned. The first character of the old book code indicates the book's location.

- This book location is to be retained and stored in an array `Location`.
- Each new book code will be a unique integer number that will be generated by the program. The first number will be 1.

Use will be made of a 'built-in' function `StartString`. It is defined in the help files as follows:

```
Function StartString(ThisString : String; NoOfCharactersToRetain : Integer) :
String ;
```

The function is given the string **`ThisString`** and returns the number of characters specified by **`NoOfCharactersToRetain`** starting from the first character of **`ThisString`**.

(i) What are the values of the **parameters** used in the following code?

```
NewString := StartString('T76542', 1)
```

1 .....

2 .....

(2 marks)

(ii) What value is assigned to `NewString` when this code is executed?

.....

(1 mark)

Question 4 continues on the next page

Turn over ▶

(iii) The pseudo-code for the algorithm to calculate the new book codes and the locations is shown below.

```
NextAvailableCode ← 1
Book ← 1
Repeat
  If YearFirstInStock[Book] >=1992
     Then
       Begin
         LocationLetter ← StartString(BookCode[Book], 1)
         If LocationLetter = 'T'
            Then Location[Book] ← 'Torrington'
         If LocationLetter = 'M'
            Then Location[Book] ← 'Morristown'

         NewCode[Book] ← NextAvailableCode
         NextAvailableCode ← NextAvailableCode + 1
       End

  Book ← Book + 1
Until BookTitle[Book] = 'XXX'
```

Trace the execution of this algorithm by completing the trace table **Figure 4**; use the data shown in the table **Figure 3**.

Show also the final contents of the `Location` and `NewCode` arrays in **Figure 5** and **Figure 6**.

Figure 3

	BookTitle
[1]	Hang-gliding made simple
[2]	Around the world in 80 days
[3]	My way
[4]	Starting with hypnotherapy
[5]	Kim Smith – the autobiography
[6]	XXX

	BookCode
[1]	T05320
[2]	T76542
[3]	M11981
[4]	M79080
[5]	M00876
[6]	

	YearFirstInStock
[1]	1993
[2]	2001
[3]	1990
[4]	2005
[5]	1991
[6]	

LEAVE MARGIN BLANK

Figure 4

NextAvailableCode	Book	LocationLetter
1	1	'T'

Figure 5

Location

[1]	
[2]	
[3]	
[4]	
[5]	

Figure 6

NewCode

[1]	
[2]	
[3]	
[4]	
[5]	

(6 marks)

15

Turn over for the next question

5 (a) State the principle of operation of a set of data v alues which behave as a stack.

.....

.....

(1 mark)

(b) Memory locations 600 to 605 are to be used as a stack area to store character data, and the first value added to the stack is to be stored at address 600.

Figure 7

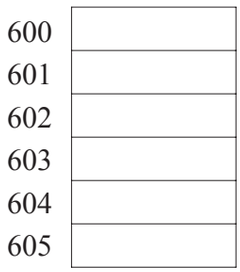
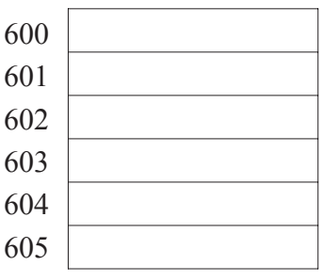


Figure 7 shows the initial empty state of the stack.

(i) Show on **Figure 8** the state of the stack after the characters 'A', 'V', 'E', 'R' and 'Y' join the stack.

(1 mark)

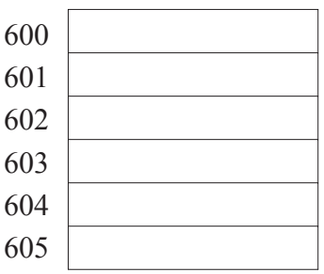
Figure 8



(ii) Two items are removed from the stack. Show on **Figure 9** the state of the stack.

(1 mark)

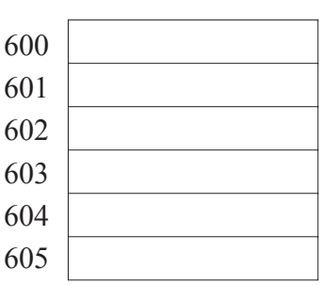
Figure 9



(iii) Two new characters 'S' and 'P' join the stack. Show on **Figure 10** the final state of the stack.

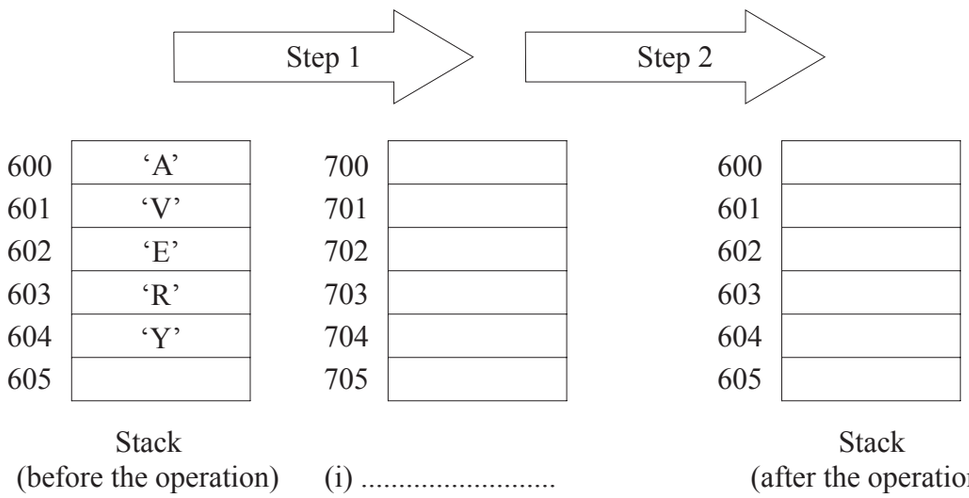
(1 mark)

Figure 10



(c) The original items in this stack are to be re versed. This can be done using a second data structure which uses locations 700 to 705 respecti vely. The first item added to the stack was character 'A'.

Figure 11



(i) Name the second data str ucture. Label **Figure 11**.

(1 mark)

(ii) Describe **Step 1** in **Figure 11**.

.....

.....

(1 mark)

(iii) Describe **Step 2** in **Figure 11**.

.....

.....

(1 mark)

(iv) Show on **Figure 11** the final contents of all the memor y locations.

(2 marks)

9

Turn over for the next question

6 A programming language has two different data types for storing positive integers.

Data type `Integer1` uses a single byte to store data.
Data type `Integer2` uses two consecutive bytes to store data.

(a) The program statement below defines a variable `NoOfAccidents`.

```
Var NoOfAccidents : Integer1 ;
```

What is the largest value which can be assigned to `NoOfAccidents`?

.....

(1 mark)

(b) Two more program statements are:

```
Var JourneyMileageA : Integer1 ;
Var JourneyMileageB : Integer1 ;
```

Interpreter software uses address 600 for storing a value for `JourneyMileageA`. See **Figure 12**.

(i) State the **denary value** for the stored binary value.

`JourneyMileageA =` .....

(1 mark)

(ii) The program statement:

```
JourneyMileageB := 138 ;
```

stores the data value for `JourneyMileageB` at address 603.

What **binary value** will be stored at location 603?

.....

(1 mark)

Figure 12

Address	Contents
600	0101 0001
601	1010 1010
602	1111 1100
603	
604	
~	~
~	~
700	0000 0010
701	0000 1010
702	
703	

(c) Another program statement is:

```
Var TotalMileage : Integer2 ;
```

The interpreter software uses locations 700 and 701 to store a value for `TotalMileage` with the most significant byte stored at location 700. See **Figure 12**.

What is the **denary value** assigned to `TotalMileage`?

.....

(1 mark)

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(d) Programs also work with character data.

Table 3

ASCII Code Table

Character	Decimal	Character	Decimal	Character	Decimal
<space>	32	I	73	R	82
A	65	J	74	S	83
B	66	K	75	T	84
C	67	L	76	U	85
D	68	M	77	V	86
E	69	N	78	W	87
F	70	O	79	X	88
G	71	P	80	Y	89
H	72	Q	81	Z	90

(i) Using the ASCII code table shown in **Table 3**, what is the **7-bit binary ASCII** code for character 'B'?

.....

(1 mark)

(ii) When a parity bit is included, character codes are stored as 8-bit binar y numbers where the most significant bit is a parity bit. This system will use **even parity**.

Describe how the parity bit is used during data transmission of a single character .

.....

.....

.....

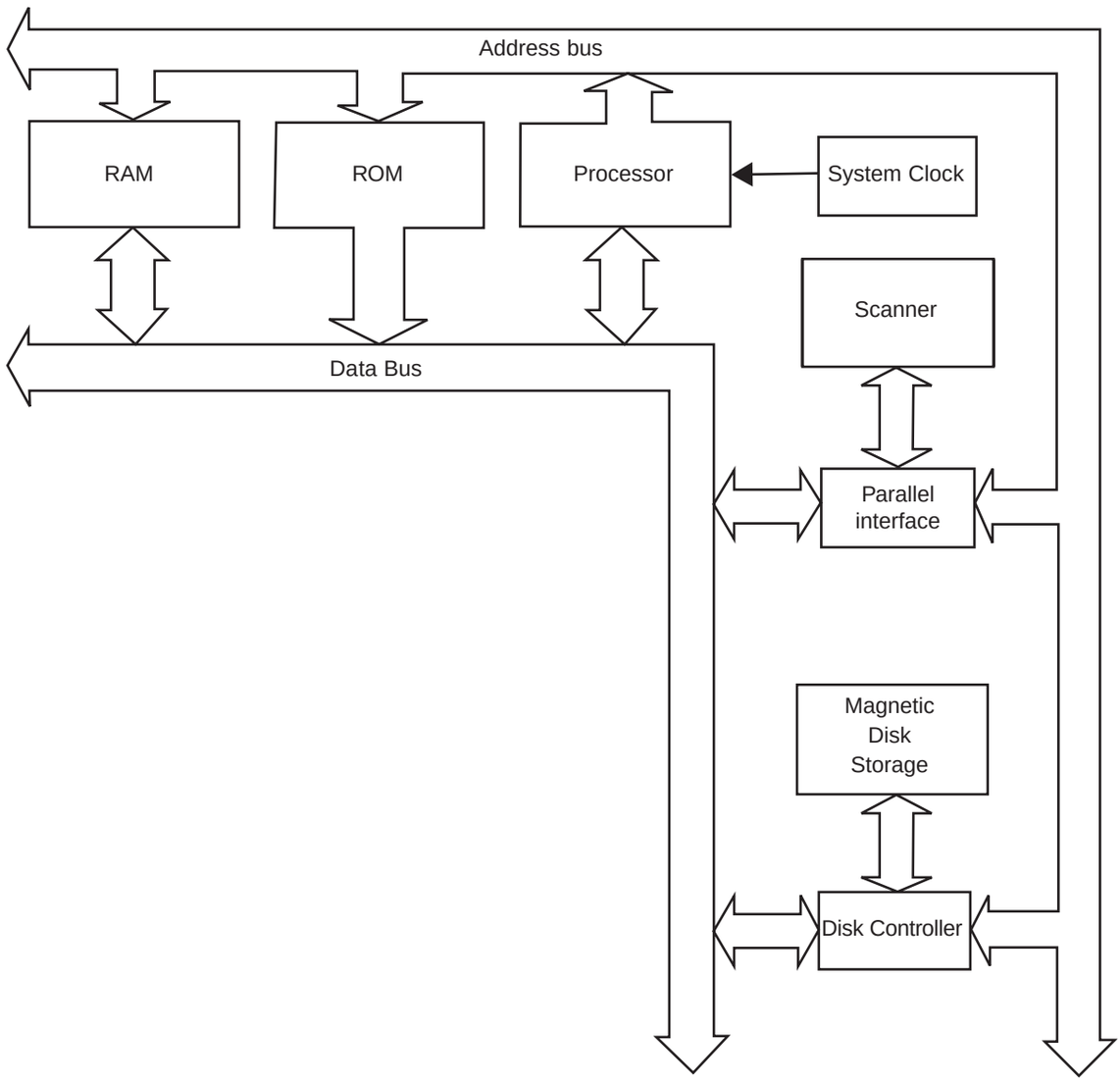
(2 marks)

7

Turn over for the next question

7 **Figure 13** shows an incomplete diagram of a typical computer system architecture.

Figure 13



(a) Two of the components shown in **Figure 13** for a typical PC, are the RAM and the Magnetic Disk Storage. Select from the list below a typical specification value for each component.

300 GB 2 MHz 1 GB 128 kbps 3.0 MHz

(i) RAM .....

(1 mark)

(ii) Magnetic Disk Storage .....

(1 mark)

(b) A third bus has been omitted from the diag ram in **Figure 13**.

Name this bus. .....

(1 mark)

(c) Explain why the data bus is bi-directional, but the address bus is one-w ay only.

.....

.....

.....

.....

(2 marks)

(d) The processor perform s different types of operations; for e xample, arithmetic operations.

Name **one** other type of operation. .....

.....

(1 mark)

(e) Explain the **stored program concept**. .....

.....

.....

.....

(3 marks)

9

END OF QUESTIONS

There are no questions printed on this page