

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use
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General Certificate of Education  
 January 2007  
 Advanced Subsidiary Examination



**COMPUTING**  
**Unit 1 Computing Systems, Programming and Networking Concepts**

**CPT1**

Monday 15 January 2007 1.30 pm to 3.00 pm

<p><b>You will need no other materials.</b>          You may use a calculator.</p>
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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. Quality of Written Communication will be assessed in all answers.

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Question	Mark	Question	Mark
1		9	
2			
3			
4			
5			
6			
7			
8			
Total (Column 1)		→	
Total (Column 2)		→	
TOTAL			
Examiner's Initials			

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

1 (a) Explain the difference between hardware and software.

.....  
 .....  
 .....

(2 marks)

(b) (i) Which of the following is a typical value for the clock speed of a processor?

512 MB    128 kbps    80 GB    2 Mb/s    3.0 GHz    (circle your answer)  
 (1 mark)

(ii) Which of the following is a typical value for the capacity of a memory card for use with a digital camera or other device?

512 MB    256 bits/sec    50 GB    2 bytes    3.0 GHz    (circle your answer)  
 (1 mark)

4

2 **Table 1** lists a number of items of software.

Complete the table by adding the letter which best describes each item of software. No letter should be used more than **once**.

**Table 1**

Software	Description (letter below)
Income tax calculation software	
Translator software for the C++ programming language	
Word processing software	
Operating system	

- A – System software
- B – Assembler software
- C – Bespoke software
- D – Interpreter or compiler software
- E – Utility software
- F – General purpose application software
- G – Special purpose application software

(4 marks)

4

3 **Table 2** shows the contents of three memory locations.

**Table 2**

Address	Memory contents
56	0011 0111
57	1000 1001
58	1100 0000

- (a) If the binary codes each represent a pure binary integer, what are the denary numbers stored at locations 56 and 57?

Address	Memory contents	Denary
56	0011 0111	
57	1000 1001	

(2 marks)

- (b) If, instead, the two binary codes each represent a BCD number, what denary numbers are stored at locations 56 and 57?

Address	Memory contents	BCD
56	0011 0111	
57	1000 1001	

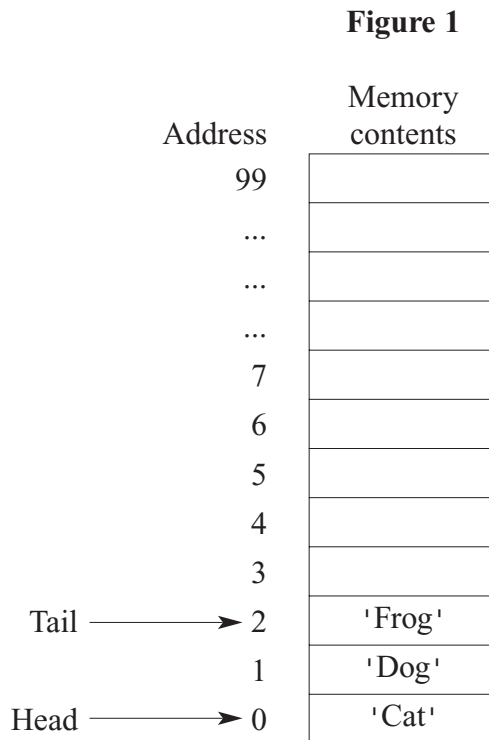
(2 marks)

- (c) Explain why the binary code at address 58 cannot represent a BCD number.

.....  
.....

(1 mark)

- 4 **Figure 1** shows an area of 100 memory locations which are used to store string data values. This area of memory behaves as a queue. The Head and Tail values are used to control changes to the queue. **Figure 1** shows the state of the queue after three values have been added.



- (a) What is the function of the Tail pointer?

.....  
 .....

*(1 mark)*

- (b) Which item in the queue will be the first item to leave?

.....

*(1 mark)*

**Figure 2**

Address	Memory contents
99	
...	
...	
...	
7	
6	
5	
4	
3	
2	'Frog'
1	'Dog'
0	'Cat'

- (c) Three new items join the queue in the order 'Snake', 'Eel' and 'Shark' and two items then leave.

Draw on **Figure 2** the new state of the queue, including the Head and Tail pointers.

*(3 marks)*

- (d) After extensive data changes the queue will become unusable. Explain why this is so.

.....

.....

*(2 marks)*

7
---

**Turn over for the next question**

5 A spreadsheet is produced which stores the number of students recruited at a College for each course. The spreadsheet also shows the target number of students the College aimed to recruit for each course. A graphics file is produced from the data stored in the spreadsheet. The file is a bit-mapped graphic which when viewed on screen displays a bar chart showing the actual course numbers and target numbers.

Use this example to explain the terms:

(a) Data .....  
.....  
.....  
*(1 mark)*

(b) Information .....  
.....  
.....  
*(1 mark)*

2
---

6 (a) Well constructed programs use a structured approach for the design and coding stages.

One practical way in which the programmer will use a structured approach to programming is the use of subroutines (procedures/functions). Give **three** other ways.

- 1 .....
- 2 .....
- 3 .....

(3 marks)

(b) A program is to be written which calculates the hourly pay rate for an employee. The calculation is based on the number of complete years the employee has worked for the firm (e.g. 3 years). All employees get a basic £7.88 per hour. For each year worked, up to a maximum of 5 years only, an additional £0.65 is added to the basic hourly rate.

The algorithm for this program is as follows:

- 1. Enter the surname
- 2. Enter the number of years of service
- 3. Calculate the employee's pay rate
- 4. Output the surname and pay rate

(i) Complete **Table 3** showing **three** variable identifiers and their data types you would use for this problem.

**Table 3**

Variable Identifier	Data Type

(3 marks)

(ii) The detail for step 3 in the algorithm is broken down into more detail as follows:

- 3.1 If the number of years of service value is over 5, then change the value stored to 5
- 3.2 Calculate the employee's pay rate

Write pseudo-code for these two steps using the appropriate identifiers from **Table 3**.

- 3.1 .....
- .....
- 3.2 .....
- .....

(3 marks)

- 7 **Figure 3** shows an area of main memory storing a text file which is about to be sent to a printer.

**Figure 3**

Address	Contents
0	
1	
...	
...	
150	0100 0101
151	0101 1000
152	0100 0001
153	0100 1101

**Table 4**

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

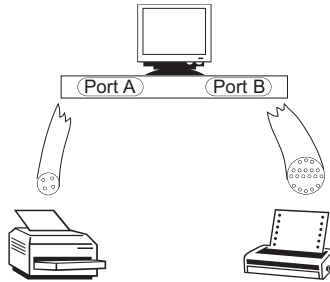
- (a) Assuming the first character to be printed is held at address 150, show the **first four** characters to be printed on the page. Use **Table 4**.

.....  
(3 marks)



- (b) **Figure 4** shows there are two printers available on the PC and they are connected to the computer. One is connected to port A, the other to port B.

**Figure 4**



The cable which connects to port A has 4 wires and connects to a USB printer.

The cable which connects to port B has 25 wires of which eight are used for sending data bits.

- (i) What does USB stand for?

.....  
 (1 mark)

- (ii) What type of data transmission occurs using Port B?

.....  
 (1 mark)

- (iii) The computer communicates with the printer connected to port B using a **handshaking protocol**. Explain this term.

.....  
 .....  
 .....  
 .....  
 (2 marks)

- (iv) The port B cable uses 8 wires for data bits. Using a handshaking protocol, the other wires are used to send various signals. Name **one** signal.

.....  
 (1 mark)


- (v) **Figure 3** shows the first four bytes of the text file to be printed. Name **two** necessary items of software resident in main memory at the time the printout is produced.

1.....  
 2.....  
 (2 marks)

8 Figure 5 shows the home page for the Intranet site of XYZ College.

Figure 5

<a href="#">Simple Text Version</a>	<a href="#">Intranet</a>	<a href="#">External site</a>	<a href="#">IT Help desk</a>	<a href="#">Weather Site</a>	<a href="#">First Class</a>
	<a href="#">Computer Availability</a>	<a href="#">Learning Resources</a>	<a href="#">Staff Room</a>	<a href="#">Student Services</a>	

<p><b>Business</b></p> <ul style="list-style-type: none"> <li><a href="#">Accounts</a></li> <li><a href="#">Economics</a></li> <li><a href="#">Business Studies</a></li> <li><a href="#">Applied Business</a></li> <li><a href="#">Leisure Studies and Travel &amp; Tourism</a></li> </ul> <p><b>Humanities</b></p> <ul style="list-style-type: none"> <li><a href="#">Archaeology</a></li> <li><a href="#">English</a></li> <li><a href="#">Geology</a></li> <li><a href="#">Geography</a></li> <li><a href="#">Government and Politics</a></li> <li><a href="#">History</a></li> <li><a href="#">Law</a></li> <li><a href="#">Philosophy</a></li> <li><a href="#">Psychology</a></li> <li><a href="#">Religious Studies</a></li> <li><a href="#">Sociology</a></li> </ul> <p><b>Information Technology</b></p> <ul style="list-style-type: none"> <li><a href="#">Computing</a></li> </ul>	<p><b>XYZ College Intranet</b></p> <p><b>UCAS CARDS</b> Would all year one students read the intranet notice about applying for a UCAS card and follow the instructions, please? This needs completing before the end of term.</p> <hr/> <p><b>STUDENT COUNCIL ELECTIONS</b> To all students There are 21 students standing for election as your Student Council and they are prepared to give their time and efforts to support you during your time at XYZ College.</p> <hr/> <p><b>EXAM CERTIFICATES</b> Year 2 students – please collect your AS exam certificates from the Exams Office.</p> <hr/> <p><b>APPLICATIONS FOR UCAS CARD</b> Year one students thinking of going to university are advised to apply for a UCAS (Universities and Colleges Admissions Service) Card by completing the registration on the UCAS web site this term.  The card will enable you to receive constant updates from UCAS and also discounts at selected shops and stores. You will be able to use it when we take you to the Higher Education Fair at ThisTown next March. Any university stands you visit will be able to take an imprint of your personal details to maintain contact with you. This can save a great deal of time and trouble for you.</p>	<p><b>Quick Links</b></p> <p><b>COURSE QUALITY QUESTIONNAIRE</b></p>  <p><b>Read the Student Bulletin</b></p> <p><b>ucas.com</b> Information Available Here</p> <p><b>Careers Information</b></p> <p><b>WRITING AN EFFECTIVE PERSONAL STATEMENT</b></p> <p><b>STUDENT COUNCIL Intranet site</b></p> <p><b>Search Engines</b></p> <p><a href="#">Engine 1</a></p> <p><a href="#">Engine 2</a></p>
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(a) (i) What is an Intranet? .....

.....  
(1 mark)

(ii) Give **two** reasons why a student would use this Intranet site.

1 .....

.....

2 .....

.....  
(2 marks)



- 9 A company makes sofas and operates seven days a week. Each day a record is made of the number of sofas that are rejected at the final quality control stage. An average of one reject each day is considered acceptable. This is investigated using the program below at the end of each week.

```

Program RejectReport;
Var
  DayNo: Integer;
  RejectTotal: Integer;
  DailyRejects: Array [1..7] of Integer;

Begin
  RejectTotal := 0;
  For DayNo := 1 To 7
    Do RejectTotal := RejectTotal + DailyRejects [DayNo];
  WriteLn(RejectTotal);
End.

```

- (a) What does this program do?

.....  
 .....  
 .....  
 (2 marks)

- (b) (i) Write the assignment statement in the program which performs a calculation.

.....  
 (1 mark)

- (ii) Write a declaration statement that appears in the program.

.....  
 (1 mark)

- (iii) What is the purpose of the variable `DayNo`?

.....  
 (1 mark)

- (iv) What type of data structure is `DailyRejects`?

.....  
 (1 mark)

- (c) The program is to be extended to report whether this was a satisfactory week for the number of rejected sofas. An average of one reject each day is considered acceptable.

Write additional programming statement(s), in the language you are familiar with, to report one of the messages 'Investigate' or 'Inside weekly tolerance'. Use the same variable identifiers as used in the program given.

.....

.....

.....

.....

.....

.....

(2 marks)

- (d) *"A programming team should make extensive use of program libraries."*

Explain this statement .....

.....

.....

.....

(2 marks)

**Question 9 continues on the next page**

- (e) Another application is to be developed. The number of rejects per week is recorded over a five-week period. This data is stored in array `NoOfRejects`. The array `WeeklySupervisor` records who the supervisor was for week 1, week 2, etc. A third array `SupervisorTotal` will record the total number of unsatisfactory weeks for each of the three supervisors.

The pseudo-code which follows in **Figure 7** makes clear which array position is used for each supervisor.

**Figure 7**

NoOfRejects		WeeklySupervisor		SupervisorTotal	
[5]	9	[5]	'Jones'	[3]	
[4]	8	[4]	'Summers'	[2]	
[3]	1	[3]	'Jones'	[1]	
[2]	9	[2]	'Summers'		
[1]	8	[1]	'Franks'		

```
SupervisorTotal [1] ← 0
SupervisorTotal [2] ← 0
SupervisorTotal [3] ← 0
```

```
For WeekNo ← 1 to 5
  ThisNumber ← NoOfRejects [WeekNo]
  If ThisNumber > 7 Then
    Output 'Investigate'
    Call AddToSupervisorTotal
  End If
End For
```

```
Procedure AddToSupervisorTotal
  If WeeklySupervisor [WeekNo] = 'Franks'
    Then SupervisorTotal [1] ← SupervisorTotal [1] + 1
  End If
  If WeeklySupervisor [WeekNo] = 'Summers'
    Then SupervisorTotal [2] ← SupervisorTotal [2] + 1
  End If
  If WeeklySupervisor [WeekNo] = 'Jones'
    Then SupervisorTotal [3] ← SupervisorTotal [3] + 1
  End If
End Procedure
```

- (i) The number of unsatisfactory weeks when Jones was in charge is stored in the array `SupervisorTotal`. At what position in the array is this number stored?

.....  
(1 mark)

- (ii) Trace the algorithm by completing the trace table in **Table 5**.

**Table 5**

WeekNo	ThisNumber	Output	SupervisorTotal		
			[1]	[2]	[3]
			0	0	0
1					

(6 marks)

**END OF QUESTIONS**

**There are no questions printed on this page**