GENERAL INSTRUCTIONS

1. There are **TWO** sections, A and B, in this Paper. Section A carries 40 marks and Section B carries 60 marks. You are advised to finish Section A in about 48 minutes.

2. Section A consists of multiple-choice questions in this question book. Section B contains conventional questions printed separately in Question-Answer Book B.

3. Answers to Section A should be marked on the Multiple-choice Answer Sheet while answers to Section B should be written in the spaces provided in Question-Answer Book B. **The Answer Sheet for Section A and the Question-Answer Book for Section B must be handed in separately at the end of the examination.**

SECTION A (MULTIPLE-CHOICE QUESTIONS)

INSTRUCTIONS FOR SECTION A

1. Read the instructions on the Answer Sheet carefully. Stick a barcode label and insert the information required in the spaces provided.

2. When told to open this book, you should check that all the questions are there. Look for the words ‘**END OF SECTION A**’ after the last question.

3. All questions carry equal marks.

4. **ANSWER ALL QUESTIONS.** You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber.

5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

6. No marks will be deducted for wrong answers.
There will be 40 questions in 2012 examination paper. For this sample paper, there are only 20 sample questions for illustration purpose.

(2005 CECIT 1A Q.1)
1. To create a web page with Traditional Chinese and Simplified Chinese characters, which of the following methods is/are possible?

(1) Use Unicode on the web page.
(2) Use both BIG5 and GB on the web page.
(3) Use BIG5 to represent traditional Chinese characters and image files to display simplified Chinese characters.

A. (1) only
B. (2) only
C. (1) and (2) only
D. (1) and (3) only

(2005 CECIT 1A Q.4)
2. The hardware address of a network device consists of 48 bits. Which of the following is a valid address in hexadecimal numbers?

A. 00E007194480
B. 00A23B5
C. 1E07F124372
D. 398A7E9412110408

(2005 CECIT 1A Q.5)
3. When using a presentation software package, which of the following may be used to prepare the above slide efficiently?

(1) sorting
(2) borders
(3) copy and paste
(4) find and replace

A. (1) and (2) only
B. (2) and (3) only
C. (3) and (4) only
D. (1) and (4) only
4. Which of the following is not a specification of a CPU?

A. 2.8GHz Clock speed
B. 2MB Cache memory
C. 4.2ms Rotation latency
D. 32-bit word size

5. Which of the following is not open source software?

A. Internet Explorer
B. Apache HTTP Server
C. Fedora Linux
D. Open Office

6. When compared with normal PCs, which of the following statements about Personal Digital Assistants (PDA) is correct?

A. Only small files can be stored.
B. The operating system requires less system memory to operate.
C. The operating system should be re-installed when the system crashes.
D. Data must be stored in an external flash memory card.

7. Which of the following actions should not be carried out when constructing a web page?

A. Insert more than one hyperlink.
B. Compile the HTML file.
C. Insert multimedia elements but not photos.
D. Use .htm as the filename extension.

8. The following algorithm shows how a vending machine works:

Step 1: Wait to receive a coin.
Step 2: If the coin is not $1, $2, $5 or $10, eject it.
Step 3: If $6 or more is deposited, do steps 4 and 5.
Step 4: Release a can of lemon tea.
Step 5: Reduce the deposit by $6.
Step 6: Eject the deposit.
Step 7: Do step 1.

Which of the following statements about the algorithm is true?

A. A can of lemon tea will cost less than $6.
B. The vending machine will release lemon tea.
C. A can of lemon tea will cost more than $6.
D. The vending machine will release lemon tea only if a $10 coin is received.
9. Which of the following statements about copyright is correct?

A. It is effective only if the author has a statement about copyright on his/her work.
B. It applies to computer software only.
C. The author must register his/her work to obtain copyright.
D. It applies automatically to the owner of the original work.

10. What is the minimum number of bits needed to represent a set of 94 characters of ‘Hangul’ in the Korean language?

A. 7
B. 8
C. 9
D. 10

11. Jimmy wants to include some multimedia elements in a presentation file. Instead of copying the multimedia elements into the file, he uses hyperlinks. Which of the following descriptions is correct?

A. The presentation can include more multimedia elements.
B. The presentation can be more interactive.
C. The presentation can play video files immediately.
D. The presentation file is smaller.

12. A 3×3 table is created in spreadsheet software and the preview of the printout is shown below:

Which of the following actions is the most appropriate way to improve the presentation of the table?

A. Change the horizontal alignment of the cells in the table.
B. Change the page orientation.
C. Change the border setting.
D. Change the print area.
(2006 CECIT 1A Q.17)
13. Which of the following I/O devices are commonly used by a cashier in a restaurant?

(1) Magnetic strip card reader
(2) Optical character reader
(3) Inkjet printer
(4) Thermal printer

A. (1) and (3) only
B. (1) and (4) only
C. (2) and (3) only
D. (2) and (4) only

(2006 CECIT 1A Q.19)
14. Which of the following is not an online public service provided by ESDlife (生活易)?

A. Booking a football field
B. Making a dentist’s appointment
C. Booking an appointment to give a marriage notice
D. Ordering past HKCE examination papers

(2006 CECIT 1A Q.20)
15. Mr. Chan wants to register a domain name using his name, ‘Chan Tai Man’. Which of the following domain names is not valid?

A. chantaiman.co.uk
B. chantaiman.com.org
C. chantaiman.com.hk
D. ChanTaiMan.Net

(2006 CECIT 1A Q.24)
16. Lily tells her friends, Ka Kee (KaKee@hkeaa.edu.hk), Po Yan (PoYan@hkeaa.edu.hk) and Mo Yi (MoYi@hkeaa.edu.hk), the date of her birthday party through an email as shown below. Which of the following statements cannot be derived from this email?

To: KaKee@hkeaa.edu.hk
CC: PoYan@hkeaa.edu.hk
BCC: MoYi@hkeaa.edu.hk
SUBJECT: My birthday party on 25/4

Hi,
Call me if you could come!  :p
Lily

A. Ka Kee knows that the birthday party is held on 25/4.
B. Ka Kee knows that Po Yan receives the email.
C. Po Yan knows that Mo Yi receives the email.
D. Mo Yi knows that Ka Kee and Po Yan receive the email.
17. The above screen shot of a browser, shows that some Chinese characters are correctly displayed while some are not. Which of the following is the possible reason?

A. The server uses two different coding schemes to store the Chinese characters of the web page.
B. The server uses two different protocols to send the web page to the browser.
C. The browser uses two different coding schemes to decode the Chinese characters on the web page.
D. The correct display is an image.

18. Which of the following characteristics of high level language reflects the concept of program modules?

A. Subprogram
B. Comment
C. Condition
D. Looping

19. Amy owns a domain name, ‘amycomp.com’. Which of the following URLs is not owned by Amy?

B. http://mail.amycomp.com/register.htm
C. http://www.AmyComp.com/index.html
D. http://www.amycomp.com/next_level/index.html

20. The specification of a CPU, 3.0 GHz, indicates ________________.

A. the computational power
B. the data transfer rate
C. the storage capacity
D. the maximum I/O speed

END OF SECTION A

Go on to Question-Answer Book B for questions in Section B
INFORMATION AND COMMUNICATION TECHNOLOGY

PAPER 1 (Sample Paper)

SECTION B: Question-Answer Book B

This paper must be answered in English.

INSTRUCTIONS

(1) Write your Candidate Number in the space provided on Page 1.

(2) Stick barcode labels in the spaces provided on Pages 1, 3 and 5.

(3) Refer to the general instructions on the cover of the Question Book for Section A.

(4) The questions in this Question-Answer Book carry 60 marks. Answer ALL questions.

(5) Write your answers to Section B in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.

(6) Supplementary answer sheets will be provided on request. Write your candidate number, fill in the question number and stick a barcode label on each sheet. Tie them loosely but securely with a string INSIDE this Question-Answer Book.
Answer all questions. Write your answers in this question-answer book.

(Modified from 2007 ASCA I/ALCS I Q.8)

1. Mary uses her desktop computer at home to analyse a survey.
   (a) Mary suspects that her computer is infected by spyware. Give two unusual events that may alert her to this possible infection.

   (2 marks)

   (b) After completing the analysis, Mary prepares her findings in PDF file format and posts the file onto her website for the public to download. Give two reasons to support her use of this file format.

   (2 marks)

   (c) Mary also shows her findings using presentation software. Suggest three precautions which should be taken when including text in a presentation.

   (3 marks)

   (d) After the presentation, Mary decides to collect more views from respondents and sends them each a questionnaire by postal mail, for which a name label is required. The name and sex of each respondent are stored in a worksheet and part of the worksheet is shown below.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SEX</td>
<td>FIRSTNAME</td>
<td>LASTNAME</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>May</td>
<td>Chan</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>John</td>
<td>Wong</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>Amy</td>
<td>Ho</td>
<td></td>
</tr>
</tbody>
</table>

   F and M in column A represent female and male respectively. Each name label should include the title of each respondent before his or her name, for example, Ms May Chan, Mr John Wong and Ms Amy Ho.

   (i) Mary used the following steps in a word processor to create the labels.

   (1) Use ‘mail merge’ with columns, SEX, FIRSTNAME and LASTNAME, as fields.
   (2) Produce a merged document containing all the name labels.
   (3) Use ‘find and replace’ in order to add the titles of respondents.

   Instead of “Ms May Chan”, the label shows “Mrs May Chan”. Explain why.

   (3 marks)
(ii) By making use of formula(e) in the spreadsheet, describe how to add the titles of respondents, 'Mr' and 'Ms', in column D of the worksheet.

(4 marks)

Mary uses spreadsheet software to store the responses from 40 copies of the questionnaire. Each copy consists of 6 questions. The responses to the questions are coded as values: 1, 2, 3 or 4. The following worksheet is used to record the responses.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Questionnaire</td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
<td>Q5</td>
<td>Q6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Copy 1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Copy 2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Copy 3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Copy 4</td>
<td></td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Copy 5</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Copy 40</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Mean response score</td>
<td>1.8</td>
<td>3.0</td>
<td>3.1</td>
<td>2.3</td>
<td>2.8</td>
<td>2.7</td>
<td>Total number of copies</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Total number of '1' and '2'</td>
<td>25</td>
<td>10</td>
<td>5</td>
<td>23</td>
<td>17</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Total number of '3' and '4' '</td>
<td>14</td>
<td>30</td>
<td>34</td>
<td>14</td>
<td>23</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Overall response</td>
<td>BAD</td>
<td>GOOD</td>
<td>GOOD</td>
<td>BAD</td>
<td>GOOD</td>
<td>BAD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When some responses are missing, the corresponding cells in the worksheet are left blank (e.g. D4). To calculate the total number of copies without any missing responses, firstly a formula is entered into I2 and then copied into I3 to I41. Secondly, another formula, ‘=SUM(I2:I41)’, is entered into I43.

(e) Write the formula in I2.

(2 marks)

The mean response score of a question is defined as:

\[
\text{Mean response score} = \frac{\text{Sum of all values of the responses on that question}}{\text{No. of responses on that question}}
\]

where the mean response score is correct to 1 decimal place.
(f) A formula is entered into B43, and then copied into C43 to G43, to find the mean response score for each question. Write the formula in B43.

(2 marks)

A formula, "=FREQUENCY(B2:B41, 2)" is used so that the total number of responses '1' and '2' and the total number of responses '3' and '4' for each question can be found in row 45 and row 46 respectively.

(g) How can the FREQUENCY function be entered correctly and efficiently? Describe the steps required.

(3 marks)

The overall response of a question is regarded as 'GOOD' if it fulfills the following two conditions:

- the mean response score > 2.5
- the total number of responses '3' and '4' > the total number of responses '1' and '2'

Otherwise the overall response of the question is regarded as 'BAD'. A formula is entered into B48, and then copied into C48 to G48 to find the overall responses of the questions.

(h) Write the formula in B48.

(2 marks)
(Modified from 2006 CECIT 1B Q.3)

2. David installs a desktop computer, X, and a notebook computer, Y, forming a LAN and connecting to the Internet through a 10M broadband connection in his bedroom. The configurations of the computers are as follows:

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>P4 3 GHz</td>
<td>M 1.73 GHz</td>
</tr>
<tr>
<td>Cache</td>
<td>2 MB</td>
<td>2 MB</td>
</tr>
<tr>
<td>RAM</td>
<td>512 MB</td>
<td>256 MB</td>
</tr>
<tr>
<td>Network</td>
<td>10/100 LAN card</td>
<td>10/100 LAN card and 54M wireless LAN card</td>
</tr>
</tbody>
</table>

(a) David wants to connect an external DVD writer to X.

(i) The DVD writer is not designed to connect to a parallel port. Why not?

(ii) Give the port that the DVD writer should be connected to: ________________ (2 marks)

(b) Y can be connected to the Internet through a network cable or wireless communication. Compare the performance using these two methods in the following activities in terms of data transmission speed.

(i) File sharing between X and Y

__________________________________________________________________________

(ii) Browsing the Internet

__________________________________________________________________________

(4 marks)

(c) Cache is “high-speed” memory. In X, the size of the cache is much smaller than that of RAM. In order to enhance X’s performance, should X install 512 MB cache? Explain briefly.

__________________________________________________________________________

(2 marks)

(d) In order to preserve the connectivity of X and Y in the LAN, should both be installed the same version of the operating system? Explain briefly.

__________________________________________________________________________

(2 marks)
3. David creates a web page with frames and animation.

(a) (i) David can successfully browse the animation in the web page on one computer but cannot browse it on another one. The web page is only displayed as shown above. Give a possible reason for this.

__________________________________________________________________________________________________________

(ii) Give one unsatisfactory aspect of the design of the above web page presentation, other than the animation.

__________________________________________________________________________________________________________

(3 marks)

David wants to share a file with other people. The file can be downloaded by clicking a hyperlink on the web page or by Peer-to-Peer (P2P) freeware.

(b) Give one advantage and one disadvantage of using a hyperlink to download the file.

Advantage:

__________________________________________________________________________________________________________

Disadvantage:

__________________________________________________________________________________________________________

(2 marks)

(c) List two social impacts of the inappropriate use of this P2P freeware.

1. _______________________________________________________________________________________________________

2. _______________________________________________________________________________________________________

(2 marks)
David studies in ACC College. In the college, an SMTP server is used to transfer e-mail with other SMTP servers over the Internet. The SMTP server stores the e-mail in a POP3 server, which allows client computers to retrieve the e-mail. Outgoing e-mail is sent directly through the SMTP server.

David gets the following information from ACC College.

**POP3 E-mail Account Settings on Mail Client Software:**

<table>
<thead>
<tr>
<th>SMTP Server Name / IP Address</th>
<th>smtp.acc.edu.hk / 210.0.168.23</th>
</tr>
</thead>
<tbody>
<tr>
<td>POP3 Server Name / IP Address</td>
<td>pop3.acc.edu.hk / 210.0.168.112</td>
</tr>
<tr>
<td>User Name:</td>
<td>davidchan</td>
</tr>
<tr>
<td>Password:</td>
<td>besmartboy</td>
</tr>
</tbody>
</table>

(d) Based on the information provided, fill in the following dialog box from the mail client software so that Peter can send and retrieve e-mail at home with the mail client software.

**Server Information**

<table>
<thead>
<tr>
<th>Incoming mail server:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Outgoing mail server:</td>
<td></td>
</tr>
</tbody>
</table>

(1 mark)

(e) Normally, users configure the mail client software with the server names instead of the IP addresses.

(i) Give an advantage of using the server name over the IP address.

(ii) Give an advantage of using the IP address over the server name.

(2 marks)

(f) Suppose the SMTP server is stopped but the POP3 server is still running. What functions with respect to sending and receiving e-mail can still be used? What functions cannot be used?

(2 marks)
(Modified from 2006 CECIT 1B Q.4)

4. Mr. Lam designs a simple greenhouse cooling and heating system. The ideal greenhouse temperature is between 20 °C and 32 °C. Initially, the cooler and heater are off. The system will operate as follows:

<table>
<thead>
<tr>
<th>Temperature (X)</th>
<th>Cooler (C)</th>
<th>Heater (H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X &lt; 20</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>X &gt; 32</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

The flowchart below describes the operations of the system and Module E is a part for energy conservative.

(a) Fill the appropriate conditions of X in the two decision boxes of the flowchart. (2 marks)
(b) In order to save more energy, Mr. Lam decides that the cooler will be turned off when \( X \leq 28 \), and the heater will be turned off when \( 24 \leq X \). Draft a flowchart for Module E to implement his idea in the space provided. The design of Module E should be precise and without redundancy.
(Modified from 2004 ALCS2 Q.2, 2006 ASCA1 Q.4, 2007 ASCA1 Q.7)

5. Peter is an IT manager in a company. He gives some suggestions for the ergonomics of a new computer room below:

   (1) Use adjustable chairs
   (2) Install blinds on the windows to shade the monitors nearby
   (3) Create shortcut keys for the software installed in computers

   (a) For each of the above suggestions, explain briefly how the working conditions can be ergonomically improved and state the health hazards that can be reduced.

   (1)

   (2)

   (3)

   (3 marks)

   Peter is responsible for maintaining the e-mail system in the company.

   (b) To log in to the e-mail system, users are required to enter a user number and a login password.

   ![LOGIN]

   (i) Many users enter wrong user numbers. Suggest two methods of improving the design of the system for Peter to help users enter the user numbers correctly.

   (ii) The requirement for the system's login password changes from 6 numeric digits to 8 alphanumeric characters. Give two reasons why this change results in better security.

   (4 marks)
(c) Peter and his colleague, Mary, send e-mail using public and private key encryption. Peter can send e-mail to Mary using the following two methods:

1. Peter encrypts an e-mail with Mary's public key and Mary decrypts it with her own private key.
2. Peter encrypts an e-mail with his own private key and Mary decrypts it with Peter's public key.

(i) Give an advantage of using method 1.

(ii) In fact, anyone can have Peter's public key and hence can read the e-mail sent out by Peter through method 2. Why might Peter still want to use method 2?

(iii) Suggest and describe a method of using public and private key encryption which would be better than methods 1 and 2 for allowing Mary to read e-mail sent by Peter.
INFORMATION AND COMMUNICATION TECHNOLOGY

PAPER 2A

Databases

(Sample Paper)

Question-Answer Book

Time allowed: 1 hour 30 minutes
This paper must be answered in English.

INSTRUCTIONS

(1) Write your Candidate Number in the space provided on Page 1.

(2) Stick barcode labels in the spaces provided on Pages 1, 3 and 5.

(3) Answer ALL questions.

(4) Write your answers to Section B in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.

(5) Supplementary answer sheets will be provided on request. Write your candidate number, fill in the question number and stick a barcode label on each sheet. Tie them loosely but securely with a string INSIDE this Question-Answer Book.
Answer all questions. Write your answers in this question-answer book.

(Modified from 2004 ASCA1 Q.1)
1. A database is created with the following SQL commands to store the subject scores of a class of students in an examination. REG_NO and SUBJ_CODE represent the registration number of a student and the code of a subject respectively.

   CREATE TABLE EXAM (  
     REG_NO CHAR(6),  
     SUBJ_CODE CHAR(3),  
     SCORE NUMERIC(5,1))

   CREATE TABLE STUDENT (  
     REG_NO CHAR(6),  
     STUD_NAME CHAR(20))

   CREATE TABLE SUBJECT (  
     SUBJ_CODE CHAR(3),  
     SUBJ_NAME CHAR(15))

(a) Modify the first SQL command to ensure that no records in EXAM contain empty values in REG_NO and SUBJ_CODE.

   (1 mark)

(b) Identify the primary key(s) and foreign key(s) in the database.

   ____________________________________________________________  
   ____________________________________________________________  
   ____________________________________________________________  
   ____________________________________________________________  

   (4 marks)

(c) Write an SQL command to insert the following record into SUBJECT.

   | SUBJ_CODE : | ENG |
   | SUBJ_NAME : | ENGLISH |

   ____________________________________________________________  
   ____________________________________________________________  

   (2 marks)
(d) Because of a modification in the examination paper of the subject code ENG, all students will be awarded two additional scores. Write an SQL command to increase the value of SCORE by 2 in each relevant record.

(2 marks)

(e) Describe the purpose of the following SQL command.

DELETE FROM STUDENT WHERE LEN(TRIM(STUD_NAME)) = 0

(2 marks)

(f) A student withdrew from the school after the examination. In order to maintain the referential integrity constraint of the database, it has been suggested that his record in STUDENT should not be removed. Do you agree? Explain briefly.

(2 marks)
2. In a secondary school library, a database `LIBRARY` stores the transactions in which students borrow and return books. Each student can borrow at most 5 books at a time. Each copy of book can be borrowed by one student only at a time. The field names of `LIBRARY` are described below:

<table>
<thead>
<tr>
<th>Field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>StudID</td>
<td>Unique student ID code</td>
</tr>
<tr>
<td>Stud_Name</td>
<td>Name of student</td>
</tr>
<tr>
<td>Class</td>
<td>Class attended</td>
</tr>
<tr>
<td>BookID</td>
<td>Unique book ID code</td>
</tr>
<tr>
<td>Book_Title</td>
<td>Title of book</td>
</tr>
<tr>
<td>Author</td>
<td>Author of book</td>
</tr>
<tr>
<td>Publisher</td>
<td>Publisher of book</td>
</tr>
<tr>
<td>Borrow_Date</td>
<td>Date on which the book is borrowed</td>
</tr>
<tr>
<td>Return_Date</td>
<td>Date on which the book is returned</td>
</tr>
</tbody>
</table>

(a) Explain briefly how this design leads to data redundancy.

(b) To fix the problem of data redundancy, a librarian re-designs the database and draws an E-R diagram as follows. However, the key attributes of entity, maximum cardinality, mandatory cardinality, optional cardinality are missing in the diagram. Complete the E-R diagram for the librarian.
(c) Transform the E-R diagram in (b) into database using the following schema.

STUDENT

BOOK

BORROW

(6 marks)

(d) The librarian wants to include the company name, address and phone number of publishers in the diagram. It is assumed that a publisher publishes many books and a book is published by one publisher only. Add an entity in the E-R diagram in (b).

(3 marks)

(e) Suggest a modification to the design of LIBRARY to ensure that each student can borrow 5 books at any time. The total number of books borrowed by a student is not greater than 5 at a time.

(3 marks)
3. A recreation centre provides several leisure facilities such as tennis courts and barbecue sites for its members. The centre is open daily from 9 a.m. to 11 p.m. The following database files are used to store the information of members, facilities and reservations by members.

### MEM

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Width</th>
<th>Description</th>
<th>Example of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMID</td>
<td>Character</td>
<td>6</td>
<td>Member identity number</td>
<td>123456</td>
</tr>
<tr>
<td>MNAME</td>
<td>Character</td>
<td>20</td>
<td>Name of the member</td>
<td>Chan Po Po</td>
</tr>
</tbody>
</table>

### FAC

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Width</th>
<th>Description</th>
<th>Example of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCODE</td>
<td>Character</td>
<td>3</td>
<td>Facility code</td>
<td>T02</td>
</tr>
<tr>
<td>FTYPE</td>
<td>Character</td>
<td>30</td>
<td>Type of facility</td>
<td>Tennis Court</td>
</tr>
<tr>
<td>RATE</td>
<td>Numeric</td>
<td>3</td>
<td>Charge per hour</td>
<td>40</td>
</tr>
</tbody>
</table>

### RES

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Width</th>
<th>Description</th>
<th>Example of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMID</td>
<td>Character</td>
<td>6</td>
<td>Member identity number</td>
<td>123456</td>
</tr>
<tr>
<td>FCODE</td>
<td>Character</td>
<td>3</td>
<td>Facility code</td>
<td>T02</td>
</tr>
<tr>
<td>UDATE</td>
<td>Date</td>
<td>8</td>
<td>Date of use</td>
<td>31/12/03</td>
</tr>
<tr>
<td>START</td>
<td>Numeric</td>
<td>2</td>
<td>The start time</td>
<td>11</td>
</tr>
<tr>
<td>END</td>
<td>Numeric</td>
<td>2</td>
<td>The end time</td>
<td>14</td>
</tr>
</tbody>
</table>

RES stores the information of the reservations by members in 2003.

Write SQL commands to complete the following tasks:

(a) List the names of members, without duplicates, who have reserved one or more of the facilities on 21/09/03.

```sql
SELECT MNAME FROM MEM WHERE MEMID IN (SELECT MEMID FROM FAC WHERE FDATE >= '21/09/03' AND FDATE <= '21/09/03') GROUP BY MNAME HAVING COUNT(*) > 0;
```
(b) Output the names of members who have not reserved any of the facilities of the centre. 


(3 marks)

(c) The members will be billed monthly for reserving the facilities in the centre. The charge for each facility is calculated using the following formula:

\[
\text{Charge} = (\text{END} - \text{START}) \times \text{RATE}
\]

Where 
\begin{align*}
\text{START} & \quad \text{represents the start time} \\
\text{END} & \quad \text{represents the end time} \\
\text{RATE} & \quad \text{represents the charge per hour}
\end{align*}

List the names of members, and the total amount of the charges in September for those members who are billed for more than $1000 in this month. The records in the list should be arranged in descending order of the total amount.


(5 marks)

(d) There are two soccer pitches with facility codes, 'S01' and 'S02', in the centre. Output the dates on which the two soccer pitches are both reserved.


(4 marks)

(e) There are many barbecue sites in the centre. The first character of the facility code of all barbecue sites is 'Q'. Output the facility codes of the barbecue sites which are not reserved during the time period from 6 p.m. to 9 p.m. on 21/09/03.


(5 marks)
(Modified from 2007 ALCS1 Sample Paper Q.2)

4. Kenneth is the administrator of the database system in a school. TEACHER is one of tables in the database with the following structure:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description of the teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>HKID number</td>
</tr>
<tr>
<td>Name</td>
<td>Name</td>
</tr>
<tr>
<td>Salary</td>
<td>Salary</td>
</tr>
<tr>
<td>Address</td>
<td>Address</td>
</tr>
</tbody>
</table>

(a) Kenneth wants Mary, a clerk in the school, to verify the personal information of the teachers. However, the Principal wants to keep the salary information confidential from the clerk.

Suggest a database measure which can be used to implement the above security requirement. Explain briefly how the measure can allow the clerk to verify information without any violation of confidentiality.

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

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

(2 marks)

(b) The principal asks Kenneth to create accounts for all 60 teachers in the school so that the teachers can access the school database to check students' information. To protect the data privacy, teachers can be only allowed to view data in the tables containing student information, but not the teacher information in TEACHER.

There are two common approaches to assigning account privileges: account-level and table-level. Which one is more suitable? Justify your answer.

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

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

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

(3 marks)
In the extracurricular activities, each club is led by at least one chairperson. Each student is allowed to lead at most one club. The information on chairpersons of all clubs is stored in the following table CLUB:

\[
\text{CLUB} (\text{ClubID}, \text{ClubName}, \text{Chairperson}, \text{SID}, \text{Class})
\]

In the above schema, ClubID, ClubName, Chairperson, SID and Class represent the code of the club, the name of the club, the name of the chairperson, the student ID code of the chairperson and the class of the chairperson respectively.

(c) (i) Is CLUB in first normal form (1NF)? Explain briefly.

(ii) Is CLUB in second normal form (2NF)? Explain briefly.

(iii) CLUB is not in third normal form (3NF). Why not?

(iv) Normalize CLUB to become third normal form.

(6 marks)
INFORMATION AND COMMUNICATION TECHNOLOGY

PAPER 2B

Data Communications and Networking

(Sample Paper)

Question-Answer Book

Time allowed: 1 hour 30 minutes
This paper must be answered in English.

INSTRUCTIONS

(1) Write your Candidate Number in the space provided on Page 1.

(2) Stick barcode labels in the spaces provided on Pages 1, 3 and 5.

(3) Answer ALL questions.

(4) Write your answers to Section B in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.

(5) Supplementary answer sheets will be provided on request. Write your candidate number, fill in the question number and stick a barcode label on each sheet. Tie them loosely but securely with a string INSIDE this Question-Answer Book.
Answer all questions. Write your answers in this question-answer book.

(Modified from 2001 ASCA1 Q.11)

1. Tin-tin Book Company is a book wholesaler, and has been in business for over 20 years. It has been running its daily operations manually, including ordering and delivering books. Each department uses big filing cabinets to store information about books, invoices, customer details, etc. Last year, the company purchased several stand-alone microcomputers and printers for its various departments to handle daily transactions. In order to cope with business expansion, the company’s management team has hired a system consultant to provide professional recommendations for improving the existing system and to study the feasibility of entering the overseas market.

(a) The consultant suggests connecting the stand-alone computers to make a local area network (LAN).

(i) Describe two advantages of using a LAN.

(ii) What peripheral device(s) should be installed in the computers for network connection?

(iii) Beside the computers, state two other types of equipment that are needed to form the network, and describe their functions briefly.

(b) After the company sets up the LAN, the consultant further suggests developing a web-based retailing application system to promote and sell books through the Internet.

(i) Give two possible advantages of doing business through the Internet.
(ii) Give three network considerations that the company should have in designing this application system. For each consideration, briefly describe how it affects the design.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

(8 marks)
2. A small business enterprise installs a number of personal computers (PCs). The enterprise applies for a business Internet service from an Internet Service Provider. The PCs installed with TCP/IP protocols are linked up in the form of a peer-to-peer network (p2p), which is then connected to a network device so that all the PCs can have access to the Internet.

(a) What is the main characteristic of a peer-to-peer network?

(b) Why are the PCs installed with TCP/IP protocols?

(c) In order to have its own web site and to enhance e-business, the enterprise subscribes to an Application Service Provider (ASP). An ASP is a third-party entity that manages and distributes software-based services and solutions to customers from a central data centre. The ASP provides two main products to the enterprise: (1) domain name hosting and web site hosting; and (2) communication applications.

(i) State two advantages and two disadvantages to the enterprise of subscribing to an ASP.

(ii) What types of services would you expect from the product “communication applications” provided by the ASP?
(d) To cope with future development, the company has decided to install a file server and a domain controller. The file server is used to store data and company files and the domain controller is responsible for user login.

(i) After the changes, the network is no longer a peer-to-peer network. What kind of network is it? What is its advantage over the peer-to-peer network?

(ii) The domain controller can directly refuse users permission to log on to the server. Give two other restrictions that can be imposed on the logon service.

(iii) Should all PCs be installed with the same network operating system? Why?

(5 marks)
A company provides web page design and web hosting services and its office is located on two different floors of a commercial building. Its network infrastructure is shown below:

The web server stores the web pages produced by the company for their customers. The file server supports daily business needs.

(a) (i) What is Device A? Justify your answer.

(ii) Suggest two types of network devices that can be used for Device B. Explain briefly their difference, in terms of the performance in this network.

(5 marks)
(b) How should the network be open to staff so that they can access the file server outside their office? Give two possible solutions and state their major difference.


(3 marks)

(c) The company decides to improve the network by the following actions. State the names of the devices to be added and the locations in the network.

(i) Add a device for better security.


(ii) Replace certain devices for better network traffic management.


(4 marks)

(d) Suggest two feasible types of Internet connection for the network and state the major difference between them other than the bandwidth.


(3 marks)
A small company has set up a local area network in its office. The network consists of five personal computers (PCs) and a web server connected with bus topology. All PCs can access the Internet. The staff frequently surf the Hong Kong Government’s web site for information. The Hong Kong Government’s web site has the domain name ‘info.gov.hk’ and IP address ‘202.128.227.99’.

(a) The company decides to employ a network administrator. Describe three essential duties of a network administrator.

(b) State one disadvantage of bus topology.

(c) How can a network administrator look for the IP address of a domain name?

(d) A user can view the government’s web page using the IP address ‘202.128.227.99’ but not the domain name ‘info.gov.hk’. Suggest one possible reason for this situation.

(e) What kinds of network information can be extracted from the IP address ‘202.128.227.99’?
(f) The network administrator is going to ask users to choose their own passwords. Suggest three important guidelines that should be followed by all users when choosing a password.

__________________________________________________________________________

__________________________________________________________________________

(3 marks)

(g) A network suffers from various kinds of attack.
   
   (i) One of the categories is called Spyware. What does Spyware do?

__________________________________________________________________________

(ii) Another category is called Adware. Describe how it affects the browsing of a web site.

__________________________________________________________________________

(3 marks)

END OF PAPER
INFORMATION AND COMMUNICATION TECHNOLOGY
PAPER 2C
Multimedia Production and Web Site Development
(Sample Paper)
Question-Answer Book

Time allowed: 1 hour 30 minutes
This paper must be answered in English.

INSTRUCTIONS

(1) Write your Candidate Number in the space provided on Page 1.

(2) Stick barcode labels in the spaces provided on Pages 1, 3 and 5.

(3) Answer ALL questions.

(4) Write your answers to Section B in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.

(5) Supplementary answer sheets will be provided on request. Write your candidate number, fill in the question number and stick a barcode label on each sheet. Tie them loosely but securely with a string INSIDE this Question-Answer Book.
1. An Artist designed his own web page using three frames (A), (B) and (C). He would like to share his pictures as well as other information related to Art. Two of the display screens are shown below:

Screen 1: with <My Pictures> button pressed

<table>
<thead>
<tr>
<th>My Art Gallery</th>
<th>25-04-2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;Home&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;About Me&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;My Pictures&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;Exhibitions&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;Forum&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;Useful Links&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;Feedback&gt;</td>
<td></td>
</tr>
</tbody>
</table>

My Pictures

Page 1 of 3 <1 2 3>

- Thumbnail 1
- Thumbnail 2
- Thumbnail 3
- Thumbnail 4
- Thumbnail 5
- Thumbnail 6
- Thumbnail 7
- Thumbnail 8
- Thumbnail 9

Screen 2: with <Exhibitions> button pressed

<table>
<thead>
<tr>
<th>My Art Gallery</th>
<th>25-04-2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;Home&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;About Me&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;My Pictures&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;Exhibitions&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;Forum&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;Useful Links&gt;</td>
<td></td>
</tr>
<tr>
<td>&lt;Feedback&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Exhibitions Information

1. Water Colours | Big Bug | Town Hall | 01-03-2006
2. Sculpture     | Ah Ching | Cultural Centre | 03-06-2006
3. Chinese Painting | Big Bug | Cultural Centre | 07-09-2006
4. Water Colours | Ah Ching | Town Hall | 30-04-2006
5. Chinese Painting | Peterson | Town Hall | 27-12-2006
6. Water Colours | Little Bell | Cultural Centre | 16-09-2006
7. Water Colours | Peterson | Community Hall | 11-05-2006
8. Chinese Painting | Little Bell | Cultural Centre | 12-08-2006

Answers written in the margins will not be marked.
(a) Describe the functions of the three frames (A), (B) and (C).

__________________________________________________________________________

__________________________________________________________________________

(3 marks)

(b) Give one advantage and one disadvantage of using frames in a web page.

__________________________________________________________________________

__________________________________________________________________________

(2 marks)

(c) All pictures in Screen 1 have the original resolution of 2272×1704 pixels.

(i) When a thumbnail is clicked, it shows a picture corresponding to the thumbnail with a resolution of 640×480 pixels within frame (C) even though frame (C) has a resolution of 1024×768 pixels. Explain briefly why the artist designs like this.

__________________________________________________________________________

__________________________________________________________________________

(ii) What is the aspect ratio of the pictures? Each thumbnail in Screen 1 is designed to have a resolution of 125×75 pixels. Do you think that this is a good design? Justify your answer.

__________________________________________________________________________

__________________________________________________________________________
(d) In Screen 2, the list should contain information on 20 exhibition events. How can we view the rest of the events? In order to make it easier for users to find information, the artist built in four sub-heading buttons in Screen 2. Describe briefly how these buttons function.

(3 marks)

(e) When the cursor is placed on the <Feedback> button, the bottom status line on the browser shows mailto:admin@artgallery.com.hk. What happens when the user clicks on the mouse at this moment? Recommend another method for collecting feedback.

(2 marks)

(f) The artist has now decided to host his web site by building his own web server. Give a reason to support his decision.

(1 mark)
(New Question)

2. A teacher would like to write a web page for students to practise arithmetic, as follows:

<table>
<thead>
<tr>
<th>Basic Arithmetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 3 + 4 =</td>
</tr>
<tr>
<td>2. 7 + 6 =</td>
</tr>
<tr>
<td>3. 8 + 5 =</td>
</tr>
<tr>
<td>4. 9 − 2 =</td>
</tr>
<tr>
<td>5. 8 − 6 =</td>
</tr>
</tbody>
</table>

[Submit]

The students can enter the answer of each question in the corresponding text box. When the "Submit" button is clicked, the web page will check whether the answers are correct, and the results will be displayed in a pop-up message box, as shown below:

<table>
<thead>
<tr>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 3 + 4 = 7</td>
</tr>
<tr>
<td>2. 7 + 6 = 15</td>
</tr>
<tr>
<td>3. 8 + 5 = 13</td>
</tr>
<tr>
<td>4. 9 − 2 = 6</td>
</tr>
<tr>
<td>5. 8 − 6 = 2</td>
</tr>
</tbody>
</table>

[OK]

(a) Identify whether HTML or JavaScript should be used to perform the following tasks:

(i) Show the highlighted title: ____________________________________________

(ii) Set the text boxes for accepting answers: ________________________________

(iii) Check the correctness of answers: ____________________________________

(iv) Set background music: _______________________________________________

(4 marks)
(b) The teacher would like to display an image with 1024×768 pixels at the centre. However, the display of the image through a browser is not what he expected. Comment on the problems he has encountered.

(2 marks)

(c) If the teacher wants to generate the numbers in the arithmetic questions randomly, does he need other resources other than HTML and JavaScript? Explain briefly.

(2 marks)

(d) The checking of the answers is now processed on the client side. Suggest a script in the web page for doing the checking, and give two advantages of checking answers on the client side.

(3 marks)

(e) Is it possible for the teacher to know the performance of the students from the web page? If yes, describe how the teacher would get the data from the system; otherwise, suggest a way to collect the data.

(3 marks)

(f) The teacher would like to produce web pages using animation software with action scripts instead. Give one advantage and one disadvantage of this method.

(2 marks)
3. Mr. Wong wants to design a demonstration tool for showing how an ancient Chinese character changes to its modern shape by morphing. For example,

![ancient character] ⇒ ![modern character]

(a) Give one advantage and one disadvantage of using presentation software to design the demonstration.

**Advantage:**

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

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

**Disadvantage:**

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

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

(2 marks)

(b) Animation software A can generate the interim scenes automatically according to the tweening style selected. The product can also be exported as an animated GIF file.

(i) Give one advantage and one disadvantage of using software A to design the demonstration.

**Advantage:**

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

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

**Disadvantage:**

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

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

(ii) The number of interim scenes generated in the demonstration can be affected by many attributes. Give two of them.

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

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

(iii) Besides the number of scenes, give two attributes that affect the file size of the exported animated GIF.

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

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

(6 marks)
(c) Mr. Wong has to design the demonstration as a 10-second animation which will play continuously at the entry of an exhibition. He is now considering two options for timeline control:

Option 1: Morph from second 0 to second 10.

Option 2: Show the ancient character from second 0 to second 2, morph from second 2 to second 8, and then show the modern character from second 8 to second 10.

Which option will you commend to Mr. Wong? Explain briefly.

(2 marks)

(d) Some professionals suggest that the frame rate should be greater than 20 frames per second.

(i) Do you agree this suggestion? Explain briefly.

(ii) Should the frame rate be very large, for example, 100 frames per second? Explain briefly.

(4 marks)
Audio sounds are captured and converted into digital data using a sound card before they can be processed in a personal computer. This conversion process is called digitisation and the digitised data are commonly stored in WAVE file format. The quality of the sound reproduced depends on the sampling rate and the sample size of the digitisation process. Different sound qualities using different sampling rates and sample sizes are shown in the following table:

<table>
<thead>
<tr>
<th>Sound Quality</th>
<th>Sampling Rate (kHz)</th>
<th>Sample Size (bits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>B</td>
<td>11.025</td>
<td>8</td>
</tr>
<tr>
<td>C</td>
<td>22.05</td>
<td>16</td>
</tr>
<tr>
<td>D</td>
<td>44.1</td>
<td>16</td>
</tr>
</tbody>
</table>

(a) What is the meaning of sampling rate? How does it affect the sound quality?

(b) What is the meaning of sample size? How does it affect the sound quality?

(c) Calculate the file size (uncompressed) of a one-second mono sound file of Sound Quality D.

(d) Sound Quality A is usually used for telephone conversations. Explain briefly why.

(e) Describe one advantage and one disadvantage of storing audio sounds in WAVE file format.

Answers written in the margins will not be marked.
(f) An audio clip in WAVE file format is converted into MP3 file format using a software package. Describe the main characteristics of this MP3 file and its two advantages.

______________________________________________________________________________________

______________________________________________________________________________________

______________________________________________________________________________________

______________________________________________________________________________________

(3 marks)

(g) In the conversion (f), an encoder of encoding bit rate 64 kbps is used. If a greater encoding bit rate of 128 kbps is used to do the conversion, what will be its effect on the file size of the sound file? Explain briefly.

______________________________________________________________________________________

______________________________________________________________________________________

(1 mark)

(h) Suggest one audio file format which is suitable for music composing and editing. Describe its main characteristics.

______________________________________________________________________________________

______________________________________________________________________________________

______________________________________________________________________________________

(2 marks)

END OF PAPER
INFORMATION AND COMMUNICATION TECHNOLOGY
PAPER 2D
Software Development
(Sample Paper)
Question-Answer Book

Time allowed: 1 hour 30 minutes
This paper must be answered in English.

INSTRUCTIONS

(1) Write your Candidate Number in the space provided on Page 1.

(2) Stick barcode labels in the spaces provided on Pages 1, 3 and 5.

(3) Answer ALL questions.

(4) Write your answers to Section B in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.

(5) Supplementary answer sheets will be provided on request. Write your candidate number, fill in the question number and stick a barcode label on each sheet. Tie them loosely but securely with a string INSIDE this Question-Answer Book.
Answer all questions. Write your answers in this question-answer book.

(Modified from 2005 CECIT 2A Q.1)

1. Consider the following procedure `func1`:

```
for counter i from 1 to 5
    if (A[i] > A[0]) then
        Fvalue ← A[0]
        A[0] ← A[i]
        A[i] ← Fvalue
```

After a program initialises the contents of array `A` below, it then executes `func1`.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2</td>
<td>12</td>
<td>7</td>
<td>19</td>
<td>2</td>
</tr>
</tbody>
</table>

(a) (i) Fill in the contents of the array `A` after completing the `if` statement on lines 3 to 8 when `i=1`.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) Fill in the contents of the array `A` after completing the `if` statement on lines 3 to 8 when `i=2`.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(iii) Fill in the contents of the array `A` when `func1` completes.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(6 marks)
(b) What is the purpose of the three assignment statements on lines 5, 6 and 7?

(2 marks)

(c) How many times has line 5 been executed?

(2 marks)

(d) (i) What is the purpose of `func1`?

(ii) Give an application of `func1`.

(3 marks)

(e) If line 1 is replaced by "for counter i from 5 down to 1", can `func1` achieve its purpose in (d)(i)? Explain briefly.

(2 marks)
(2007 CECIT 2A Q.4)

2. The library card number of a school consists of a leading capital letter, followed by 5 digits and a check character. In validation, the capital letters, A, B, ..., Z, represent the values, 1, 2, ..., 26, respectively. The value for the letter and each digit are multiplied by their corresponding position numbers as follows:

<table>
<thead>
<tr>
<th>Card number (example):</th>
<th>Y</th>
<th>9</th>
<th>1</th>
<th>7</th>
<th>1</th>
<th>8</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position number:</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Multiplication values:</td>
<td>25×6</td>
<td>9×5</td>
<td>1×4</td>
<td>7×3</td>
<td>1×2</td>
<td>8×1</td>
<td>check character</td>
</tr>
</tbody>
</table>

WS is defined as the sum of the multiplication values while RE is defined as the remainder of \((WS ÷ 11)\). The check character is defined as:

\[
\begin{cases} 
0 & \text{if } RE = 0 \\
A & \text{if } RE = 1 \\
\text{the digit of } (11-RE) & \text{if } RE \geq 2
\end{cases}
\]

In the example above,

\[
WS = 25×6 + 9×5 + 1×4 + 7×3 + 1×2 + 8×1 = 230
\]

\[
RE = \text{the remainder of } (WS ÷ 11) = 10
\]

Hence, the check character is 1.

(a) Find WS, RE, and the check character for the library card number, B88145.

WS = _______  RE = _______  check character = _______  (3 marks)

The computation of the check character of the library card number is done by a computer program.

(b) Given that the capital letter is stored in a character variable, ch, write a program statement to calculate the multiplication value for ch and store it in an integer variable, N.

(For example, if ch is 'Y', N should be 25×6 = 150.)

__________  (2 marks)
(c) Suppose that \textit{WS} has been calculated and stored in an integer variable, \textit{sum}. Write a program segment to find the check character and store it in a character variable, \textit{mycheck}. You are not allowed to use variables other than the following.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{sum}</td>
<td>an integer variable that has stored \textit{WS}</td>
</tr>
<tr>
<td>\textit{x}</td>
<td>an integer variable</td>
</tr>
<tr>
<td>\textit{mycheck}</td>
<td>a character variable to store the check character</td>
</tr>
</tbody>
</table>

The library card numbers are stored in a linked list in ascending order. The following example shows four card numbers in the linked list.

\[ \text{head} \rightarrow \text{A78228} \rightarrow \text{B99145} \rightarrow \text{G84176} \rightarrow \text{W91718} \rightarrow \text{(a null pointer)} \]

(d) (i) What kind of search method should be used to search for a library card number in the linked list?

(ii) Other than the search method in (d)(i), are there other common search methods applicable to this linked list? Explain briefly.

(iii) When elements are deleted, how should the memory locations of the deleted elements be handled properly?

(4 marks)
Suppose that each element of the linked list is physically stored in a pair of memory locations. The content of head pointer is the address of the first element stored in memory location 01. The content of the pointer of the last element is −1, indicating a null pointer. When the element with B99145 is deleted, the relevant pointers are updated as shown below.

Before deletion

<table>
<thead>
<tr>
<th>Memory location</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>12</td>
</tr>
<tr>
<td>12</td>
<td>A78228</td>
</tr>
<tr>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>14</td>
<td>W91718</td>
</tr>
<tr>
<td>15</td>
<td>-1</td>
</tr>
<tr>
<td>16</td>
<td>B99145</td>
</tr>
<tr>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>18</td>
<td>G84176</td>
</tr>
<tr>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>

After deletion

<table>
<thead>
<tr>
<th>Memory location</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>12</td>
</tr>
<tr>
<td>12</td>
<td>A78228</td>
</tr>
<tr>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>14</td>
<td>W91718</td>
</tr>
<tr>
<td>15</td>
<td>-1</td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>G84176</td>
</tr>
<tr>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>

(e) After the deletion, two library card numbers, X12011 and C34567, are inserted in the linked list and stored in memory locations 20, 21 and 22, 23 respectively. After each insertion, the elements of the list should be in ascending order. Write down the contents of the memory locations after each insertion.

After inserting X12011

<table>
<thead>
<tr>
<th>Memory location</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>12</td>
</tr>
<tr>
<td>12</td>
<td>A78228</td>
</tr>
<tr>
<td>13</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>W91718</td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>G84176</td>
</tr>
<tr>
<td>19</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>X12011</td>
</tr>
<tr>
<td>21</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

After inserting X12011 and C34567

<table>
<thead>
<tr>
<th>Memory location</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>12</td>
</tr>
<tr>
<td>12</td>
<td>A78228</td>
</tr>
<tr>
<td>13</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>W91718</td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>G84176</td>
</tr>
<tr>
<td>19</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>X12011</td>
</tr>
<tr>
<td>21</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>C34567</td>
</tr>
<tr>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

(5 marks)
(Modified from 2007 ALCS2 Q.3)
3. mySwap(x, y) is used to swap two elements of an accessible array, A, with indices x and y.

(a) Complete mySwap below.

[Pascal version]
procedure mySwap(x, y : integer);
var
temp : integer;
begin

A[x] := __________;

A[y] := __________;

A[x] := temp
end;

[C version]
void mySwap(int x, int y) {

int temp;

A[x] = __________;

A[y] = __________;

A[x] = temp;
}

[Visual Basic version]
Sub mySwap(ByVal x, ByVal y as Integer)

Dim temp as Integer

A(x) = __________;

End Sub

[Java version]
static void mySwap(int x, int y) {

int temp;

A[x] = __________;

A[y] = __________;

A[x] = temp;
}

(2 marks)

myRev(x, y) is used to reverse the order of the elements of A with indices from x to y without using additional arrays. The following example shows the effect of myRev (3, 6) on A.

<table>
<thead>
<tr>
<th>Before</th>
<th>Indices: 2 3 4 5 6 7 8</th>
<th>Content of A: 6 7 9 5 11 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>After</td>
<td>Indices: 2 3 4 5 6 7 8</td>
<td>Content of A: 6 11 5 9 7 65</td>
</tr>
</tbody>
</table>
(b) Given \( x \leq y \), complete myRev below.

**[Pascal version]**

```pascal
procedure myRev (x, y : integer);
begin
  while ( ) do begin
    mySwap( x, y);
  end;
end;
```

**[C version]**

```c
void myRev(int x, int y) {
  while ( ) {
    mySwap(x, y);
  }
}
```

**[Visual Basic version]**

```vbnet
Sub myRev(ByVal x, ByVal y As Integer)
  Do While ( )
    Call mySwap(x, y)
  Loop
End Sub
```

**[Java version]**

```java
static void myRev(int x, int y) {
  while ( ) {
    mySwap(x, y);
  }
}
```

(3 marks)
SegSwap(x, y, z) is used to 'swap' two segments of A. It moves the elements with indices from x to y after the elements with indices from (y+1) to z. The following example shows the effect of SegSwap(3, 7, 9) on A.

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indices: 2 3 4 5 6 7 8 9 10</td>
<td>Indices: 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>Content of A: 6 7 9 5 11 65 15 19 27</td>
<td>Content of A: 6 15 19 7 9 5 11 65 27</td>
</tr>
</tbody>
</table>

(c) Given x <= y <= z, complete SegSwap below.

**[Pascal version]**

```pascal
procedure SegSwap(x, y, z : integer);
begin
  myRev(x, y);

  ...

end;
```

**[C version]**

```c
void SegSwap(int x, int y, int z) { 
  myRev(x, y);

  ...

}
```

**[Visual Basic version]**

```vbnet
Sub SegSwap(ByVal x, ByVal y, ByVal z As Integer)
  Call myRev(x, y)

  ...

End Sub
```

**[Java version]**

```java
static void SegSwap(int x, int y, int z) {
  myRev(x, y);

  ...

}
```

(2 marks)
(d) An experimental language supports only assignment statement (=), subprogram, output statement (print), and simple arithmetic expression. Consider the following subprograms, `foo` and `main`, with integer variables `m`, `n`, `x` and `y`:

```haskell
m, n : integer;

subprogram foo(x : integer, y : integer)
{
    x = x + 1;
    y = m + 2 + y;
}

subprogram main
{
    m = 3;
    n = 4;
    foo(m, n);
    print(m);
    print(n);
}
```

(i) What is the output of `main` if the `call by value` parameters passing method is used in `foo`?

(ii) What is the output of `main` if the `call by reference` parameters passing method is used in `foo`?

(Modified from 2007 ALCS2 Q.1, 2006 ALCS2 Q.3, 2006 ALCS2 Q.10, 2007 ALCS2 Q.8)

4. A company applies a traditional software development model with five processes:

- Implementation
- Documentation
- Design
- Maintenance
- Analysis

One of them is an on-going process which is integrated into various phases of this model.

(a) (i) Which one is the on-going process?

Answers written in the margins will not be marked.
(ii) Fill in the other four processes in the appropriate boxes of the following diagram to show the progress of the software development.

(b) Give a drawback of the model and suggest a modification to it. (Candidates may modify the diagram for illustration.)

(3 marks)

The company is going to develop a system for borrowing and returning books in a library. The draft of the structure chart of the system is given below.

(c) What should be the contents of Boxes A, B and C?

A:

B:

C:

(3 marks)
(d) The salaries of IT professionals in India are much lower than in Hong Kong. The company decides to move the development work to India and downsize its organization in Hong Kong. Give two kinds of jobs relating to systems development which should remain in Hong Kong. Justify your answer.

In system development, after selecting a programming language, coding starts. During the implementation phase, some programs are compiled and the following diagram shows the compilation processes.

![Compilation Processes Diagram]

(source code) \rightarrow Lexical Analysis \rightarrow Data C

Lexical Analysis \rightarrow Parse tree

Parse tree \rightarrow Semantic Analysis

Semantic Analysis \rightarrow Parse tree with semantics

Parse tree with semantics \rightarrow Process B

Process B \rightarrow Object code

Object code \rightarrow Linking

Linking \rightarrow Executable program

(e) What are Process A, Process B and Data C?

A:

B:

C:

(3 marks)

(f) The development is completed.

(i) State a service that the company should provide for librarians.

(ii) State a service that the company or the library should provide in order to maintain the system afterwards.

(2 marks)

END OF PAPER