

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.

Please stick the barcode label here.

Candidate Number

	Marker's Use Only	Examiner's Use Only
	Marker No.	Examiner No.
Question No.	Marks	Marks
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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)

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- (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)

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(New Question)

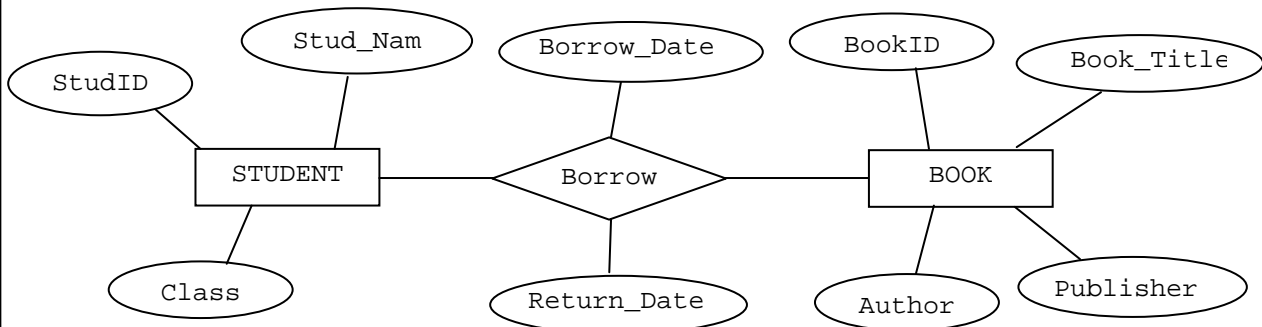
2. In a secondary school library, a database LIBRARY stores the transactions in which students borrow and return books. Each student can borrow at most 5 books at a time. Each copy of book can be borrowed by one student only at a time. The field names of LIBRARY are described below:

Field name	Description
StudID	Unique student ID code
Stud_Name	Name of student
Class	Class attended
BookID	Unique book ID code
Book_Title	Title of book
Author	Author of book
Publisher	Publisher of book
Borrow_Date	Date on which the book is borrowed
Return_Date	Date on which the book is returned

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

(2 marks)

- (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.



(2 marks)

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(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)

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(Modified from 2004 ASCA1 Q.10)

3. A recreation centre provides several leisure facilities such as tennis courts and barbecue sites for 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

	Field name	Type	Width	Description	Example of data
1	MEMID	Character	6	Member identity number	123456
2	MNAME	Character	20	Name of the member	Chan Po Po

FAC

	Field name	Type	Width	Description	Example of data
1	FCODE	Character	3	Facility code	T02
2	FTYPE	Character	30	Type of facility	Tennis Court
3	RATE	Numeric	3	Charge per hour	40

RES

	Field name	Type	Width	Description	Example of data
					<i>A member with member identity number '123456' reserves the facility with Code 'T02' from 11 a.m. to 2 p.m. on 31st December 2003.</i>
1	MEMID	Character	6	Member identity number	123456
2	FCODE	Character	3	Facility code	T02
3	UDATE	Date	8	Date of use	31/12/03
4	START	Numeric	2	The start time	11
5	END	Numeric	2	The end time	14

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.

(3 marks)

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- (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 `START` represents the start time
`END` represents the end time
`RATE` represents the charge per hour

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)

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(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:

Field	Description of the teacher
ID	HKID number
Name	Name
Salary	Salary
Address	Address

- (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)

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

CLUB(ClubID, ClubName, Chairperson, SID, 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)

END OF PAPER

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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

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Total		

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?

(3 marks)

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

(4 marks)

(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.

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(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)

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(Modified from 2004 IT 1 Q.13)

2. A small business enterprise installs a number of personal computers (PCs). The enterprise applies for 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?

(2 marks)

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

(2 marks)

(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?

(6 marks)

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(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)

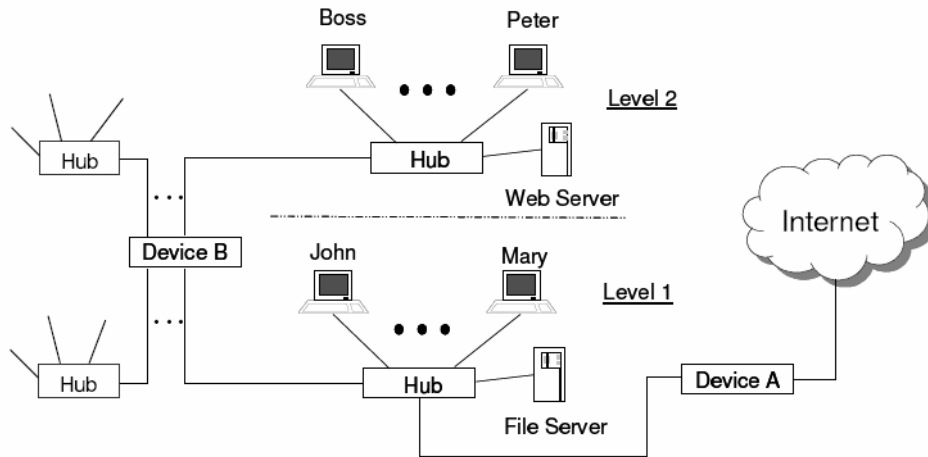
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(Modified from 2005 ASCA1 Q.10)

3. 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)

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(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)

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(2006 CECIT 2C Q.4)

4. 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.

(3 marks)

(b) State one disadvantage of bus topology.

(1 mark)

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

(1 mark)

(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.

(2 marks)

(e) What kinds of network information can be extracted from the IP address '202.128.227.99' ?

(2 marks)

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(f) The network administrator is going to ask users to choose their own passwords. Suggest 3 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

Answers written in the margins will not be marked.

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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.

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Candidate Number

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Question No.	Marks	Marks
1		
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Total		

Answer all questions. Write your answers in this question-answer book.

(2006 CECIT 2D Q.3)

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

(A) My Art Gallery		25-04-2006
(B) <Home> <About Me> <My Pictures> <Exhibitions> <Forum> <Useful Links> <Feedback>	(C) My Pictures	
		Page 1 of 3 < 1 <u>2</u> 3 >
	Thumbnail 1	Thumbnail 2
	Thumbnail 4	Thumbnail 5
	Thumbnail 7	Thumbnail 8
		Thumbnail 9

Screen 2: with <Exhibitions> button pressed

(A) My Art Gallery		25-04-2006
(B) <Home> <About Me> <My Pictures> <Exhibitions> <Forum> <Useful Links> <Feedback>	(C) Exhibitions Information	
	Type	Artist
	Venue	Date
	1. Water Colours	Big Bug
	2. Sculpture	Ah Ching
	3. Chinese Painting	Big Bug
	4. Water Colours	Ah Ching
	5. Chinese Painting	Peterson
	6. Water Colours	Little Bell
	7. Water Colours	Peterson
	8. Chinese Painting	Little Bell
		Town Hall 01-03-2006
		Cultural Centre 03-06-2006
		Cultural Centre 07-09-2006
		Town Hall 30-04-2006
		Town Hall 27-12-2006
		Cultural Centre 16-09-2006
		Community Hall 11-05-2006
		Cultural Centre 12-08-2006

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(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.

(4 marks)

Answers written in the margins will not be marked.

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- (d) In Screen 2, the list should contain information on 20 exhibition events. How can we view the list of the events? In order to make it easier for users to find information, the artist built in four sub-headings and four 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)

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(New Question)

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

Basic Arithmetic	
1. $3 + 4 =$	<input type="text"/>
2. $7 + 6 =$	<input type="text"/>
3. $8 + 5 =$	<input type="text"/>
4. $9 - 2 =$	<input type="text"/>
5. $8 - 6 =$	<input type="text"/>
<input type="button" value="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:

Results	
1. $3 + 4 = 7$	(Correct)
2. $7 + 6 = 15$	(Incorrect)
3. $8 + 5 = 13$	(Correct)
4. $9 - 2 = 6$	(Incorrect)
5. $8 - 6 = 2$	(Correct)
<input type="button" value="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)

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(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)

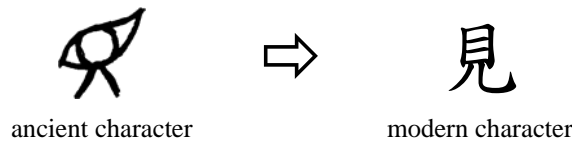
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(New Question)

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



(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)

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(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)

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(2006 CECIT 2D Q.2)

4. 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:

Sound Quality	Sampling Rate (kHz)	Sample Size (bits)
A	8	8
B	11.025	8
C	22.05	16
D	44.1	16

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

(2 marks)

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

(2 marks)

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

(1 mark)

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

(2 marks)

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

(2 marks)

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(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

Answers written in the margins will not be marked.

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**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

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Marker's Use Only	Examiner's Use Only
Marker No.	Examiner No.

Question No.	Marks	Marks
1		
2		
3		
4		
Total		

Answer all questions. Write your answers in this question-answer book.

(Modified from 2005 CECIT 2A Q.1)

1. Consider the following procedure `func1`:

```

Line      Statement
1         for counter i from 1 to 5
2         {
3           if (A[i] > A[0]) then
4             {
5               Fvalue ← A[0]
6               A[0] ← A[i]
7               A[i] ← Fvalue
8             }
9         }
    
```

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

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]
4	2	12	7	19	2

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

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]

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

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]

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

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]

(6 marks)

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(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)

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(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:

Card number (example):	Y	9	1	7	1	8	1
Position number:	6	5	4	3	2	1	↑
Multiplication values:	25×6	9×5	1×4	7×3	1×2	8×1	check character

WS is defined as the sum of the multiplication values while RE is defined as the remainder of $(WS \div 11)$. 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,

$$WS = 25 \times 6 + 9 \times 5 + 1 \times 4 + 7 \times 3 + 1 \times 2 + 8 \times 1 = 230$$

$$RE = \text{the remainder of } (230 \div 11) = 10$$

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 $25 \times 6 = 150$.)

_____ (2 marks)

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

Variables	Description
<code>sum</code>	an integer variable that has stored WS
<code>r</code>	an integer variable
<code>mycheck</code>	a character variable to store the check character

(4 marks)

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



- (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?

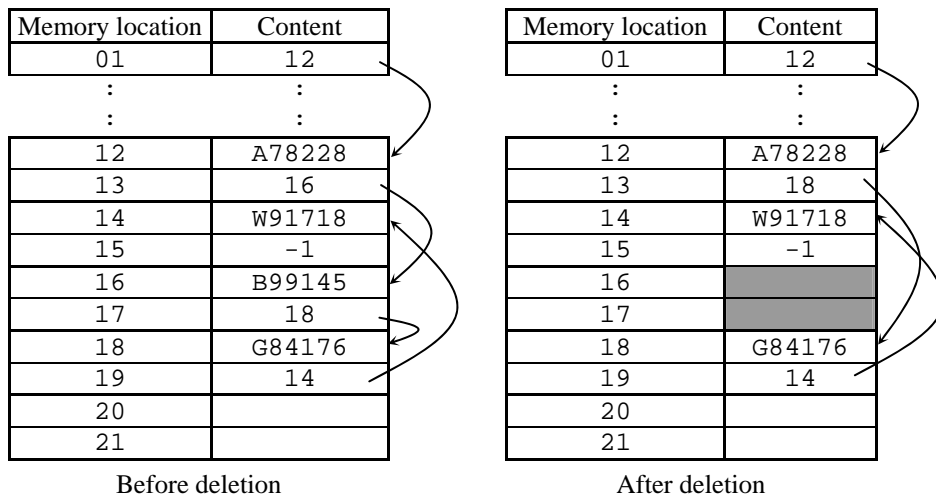
(4 marks)

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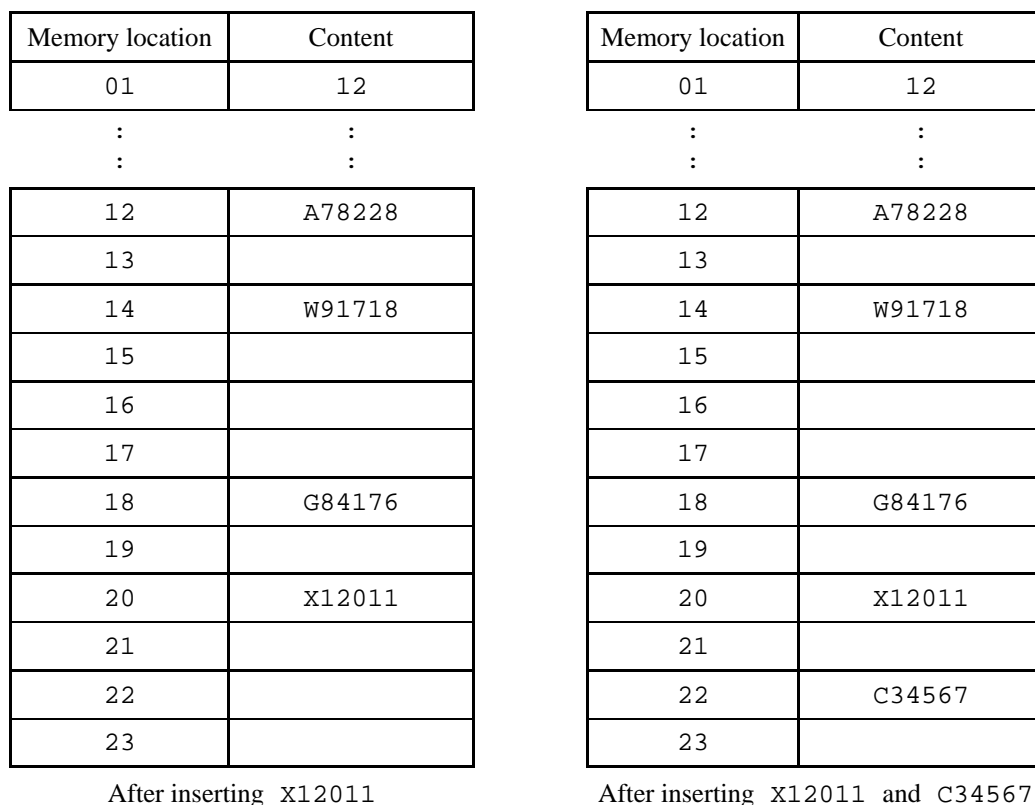
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Suppose that each element of the linked list is physically stored in a pair of memory locations. The content of the head pointer is the address of the first element stored in memory location 01. The content of the pointer of the last element is -1,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



- (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.



(5 marks)

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(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]:= temp
end;

```

[C version]

```

void mySwap(int x, int y) {
  int temp;
  [ ] ;
  [ ] ;
  A[x] = temp;
}

```

[Visual Basic version]

```

Sub mySwap(ByVal x, ByVal y as Integer)
  Dim temp as Integer
  [ ]
  [ ]
  A(x) = temp
End Sub

```

[Java version]

```

static void mySwap(int x, int y) {
  int temp;
  [ ] ;
  [ ] ;
  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`.

Before

Indices:	2	3	4	5	6	7
Content of A:	6	7	9	5	11	65

After

Indices:	2	3	4	5	6	7
Content of A:	6	11	5	9	7	65

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- (b) Given $x \leq y$, complete myRev below.

[Pascal version]

```

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

```

[C version]

```

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

```

[Visual Basic version]

```

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

```

[Java version]

```

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

```

(3 marks)

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

Before		After	
Indices:	2 3 4 5 6 7 8 9 10	Indices:	2 3 4 5 6 7 8 9 10
Content of A:	6 7 9 5 11 65 15 19 27	Content of A:	6 15 19 7 9 5 11 65 27

(c) Given $x \leq y \leq z$, complete SegSwap below.

[Pascal version]

```

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

[C version]

```

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

[Visual Basic version]

```

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

[Java version]

```

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

(2 marks)

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- (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`:

```
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`?

(4 marks)

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

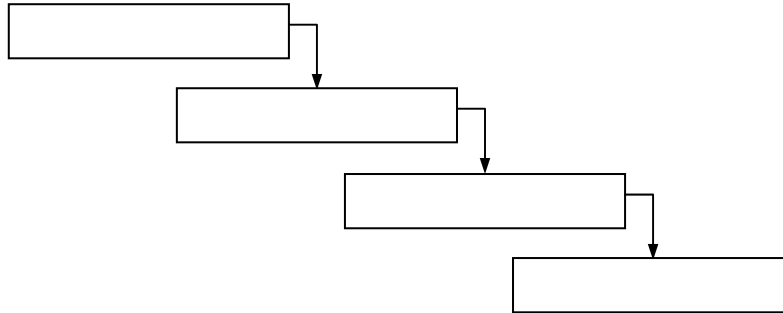
4. A company applies a traditional software development model with five processes:

- 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? _____

(ii) Fill in the other four processes in the appropriate boxes of the following diagram to show the progress of the software development.

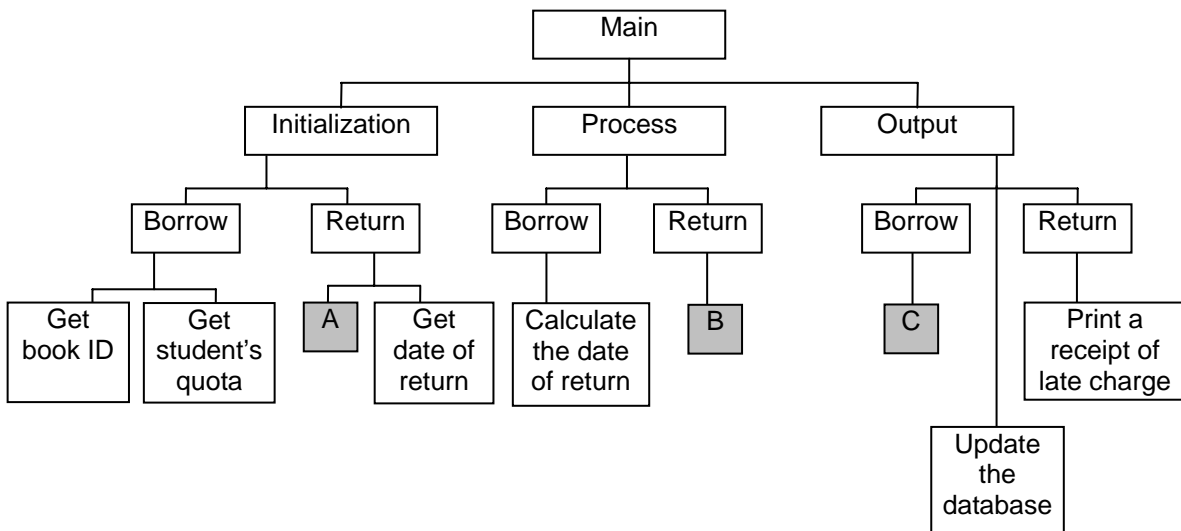


(3 marks)

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

(2 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)

Answers written in the margins will not be marked.

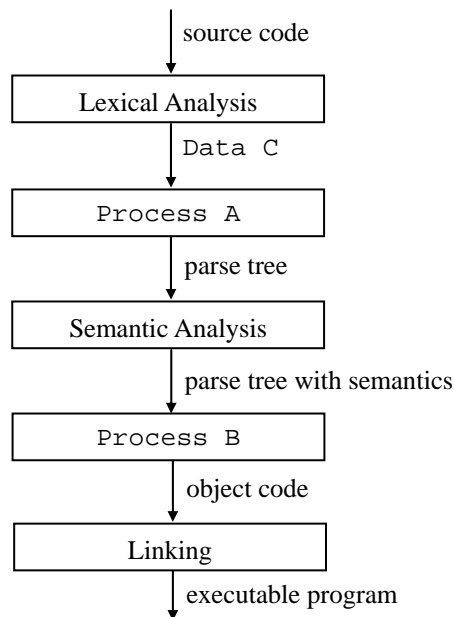
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(d) The salaries of IT professionals in India are much lower than in Hong Kong. The company decides to move the development work to India and downsize its organization in Hong Kong. Give **two** kinds of jobs relating to systems development which should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

(3 marks)

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.



(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

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