ICT 1B

Answer all questions.

1. Mr Wong is responsible for setting up an inventory system in a supermarket. He creates a database table, INVENTORY, to store the information on products for sale. Part of INVENTORY is shown below:

INVENTORY

CAT (Category)	CODE (Product code)	NAME (Product Name)	PRICE (Price of product)	QTY (Number of items in stock)
Beverage	B163	BEST juice	10.0	10
Snack	S968	홍은감자칩	12.2	40
Noodle	N042	乐乐浓汤鸡面	20.2	20
Beverage	B482	FRESH tea	25.9	80
Noodle	N091	QQ noodle	8.4	50

(a) Which field, CAT, CODE, NAME, PRICE or QTY, should be used as a key field? CODE (1)

(1 mark)

(b) The data type of QTY is integer. Judy, Mr Wong's colleague, suggests changing it to real number or string. Mr Wong disagrees with Judy's suggestion. Why?

It is because real number can contain the values which have decimal places (eg: 20.2), but the number of items in stock much be integer. Also, because the number of items in stock is a valuable number, it can be count. So, It can't change to string too (1)

(2 marks)

(c) For storing data under NAME, which character encoding system is most suitable? Explain briefly.

Unicode. It is because unicode have more space to store difference chavacters from different countries. (2)

(2 marks)

(d) (i) Mr Wong writes the following SQL command. Based on the five given records in INVENTORY above, what is the query result?

```
Select CODE, PRICE from INVENTORY where PRICE > 10 and QTY < 40
```

N042 20.2 (2)

(ii) INVENTORY is imported into a spreadsheet file. Describe, with steps, how to use the functions of spreadsheet software to extract the same data as the query result in (d)(i).

Write a formula that if the range of all of the stock which PRICE > 10 and QTY < 40, then show it code and Price out. (0)

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode

(e) Mr Wong considers replacing the existing barcode system with a Radio Frequency Identification (RFID) system, to capture product information. State one advantage and one disadvantage of using the RFID system over the barcode system.

Advantage: It can be more smaller in size

Disadvantage: the cost is more expansive (1)

(2 marks)

2. Susan buys a tablet PC for her work. The specifications of the PC are shown below.

CPU	1.2 GHz dual-core processor
Display unit	8-inch LED touch screen
Memory and storage	512 MB (ROM), 64 GB flash memory
Input / Output	USB 2.0, Built-in speaker
Connectivity	Wi-Fi, Bluetooth
Battery (life time)	14 hours
Weight	0.5 kg
Dimension	190×130×10 mm

(a) State **two** features of the tablet PC that are mainly designed for mobility.

The connectivity have Wi-Fi and Bluetooth; The weight is light, only 0.5 kg. (2)

(2 marks)

(b) (i) The tablet PC has 64 GB flash memory installed, which is quite different from an ordinary notebook computer. Why?

It is because the tablet PC need more memory unit to store the information of the computer, it is needed to be more efficiently to handle the work than a notebook computer.

(ii) Should SDRAM replace the flash memory in the tablet PC? Explain briefly.

No. It shouldn't. It is because the SDRAM only can commonly use in the computer games, printer only, be their data storing space; but the flash memory can and store the data of all part that the computer handle. (1)

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) What is the most important program stored in the ROM of the tablet PC?

bootstrap program. ✓ (1)

(1 mark)

Susan finds that her desktop computer at work is infected with a computer virus.

(d) (i) State **two** possible ways that the computer virus can be spread to other computers through the Internet.

The computer virus can be spread to other computer through the e-mail and the files that can download from the Internet. (2)

(ii) Sometimes even state-of-the-art antivirus software cannot remove some computer viruses. Explain briefly why this is the case.

It is because the computer viruses can use someway ~~to~~ hide 0 theirselves so that the antivirus software cannot detect of them.

(3 marks)

Susan suggests that Patrick, a technician in the company, install photo editing shareware with a 30-day trial period on the office computers.

(e) (i) Before the installation, what copyright issue should Patrick know about? What document should he read?

He should know that the shareware cannot use in commercial way such as sell it to the others and copy it and give the 2 copy to the others. He should read the license agreement.

(ii) Susan downloads and installs a pirated copy of photo editing software on her computer. What is the possible legal consequence of her action?

He will need to be punished by paying money or go to 1 the jail because he don't follow the law.

(3 marks)

(f) Patrick installs a software package on all computers such that the system in each computer will be automatically restored to its original state on every reboot. Give one advantage and one disadvantage of this software package.

The advantage is it can be upgrade and ed it the software ~~fastly~~ conveniencely ~~the~~ and ~~fe~~ efficiency. The disavantage is it ~~will~~ ~~effective~~ may not ~~fom~~ contain all the function of the software if he installs a software package on all computers.

0

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode

3. Mr Law develops a computer system with the help of Ada and Ben. The system is used to find the equivalent grade for an input mark.

(a) Ada uses the following pseudocode to represent her algorithm.

```
Step 1: Input a value into MARK
Step 2: If MARK < 40 Then GRADE ← 'Unattained'
Step 3: If MARK >= 40 Then GRADE ← 'Attained'
Step 4: If MARK >= 80 Then GRADE ← 'Distinction'
Step 5: Output GRADE
```

(i) What is the value of `GRADE` for each of the following values of `MARK`?

(1) `MARK = 40` `GRADE =` Attained ✓

(2) `MARK = 200` `GRADE =` Distinction ✓

(2)

(ii) Ada modifies the pseudocode by applying iteration control structure in Step 1 so that the value of `MARK` is between 0 and 100 inclusive as shown below.

Step 1: Repeat the input of values into `MARK` when the value of `MARK` is smaller than 0 or larger than 100

(1) Other than 0 and 100, give another test datum that can be used to identify the boundary cases of the algorithm.

101 ✓

(2)

(2) Which type of iteration control structure, pre-test, post-test or for loop, is used by Ada?

pre-test loop ✓

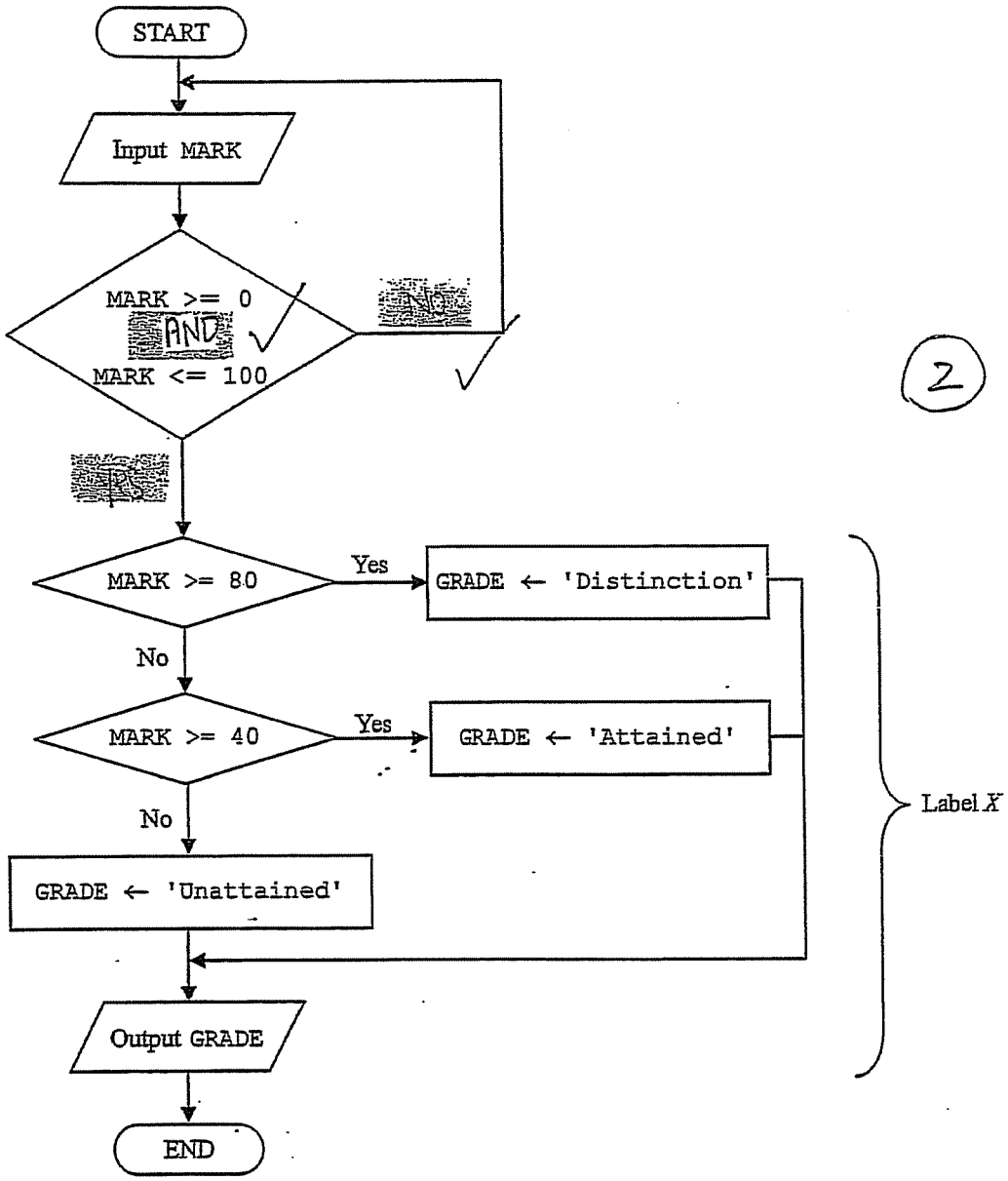
(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) Ben uses the following flowchart to represent his algorithm. Write down YES, NO and an appropriate operator in the shaded areas for the first decision box.



2

(2 marks)

(c) Compare the algorithm indicated by Label *X* with Ada's algorithm. Which one is more efficient? Explain briefly.

Ben's algorithm is more efficient. IT is because Ada's algorithm contains three conditional part (MARK<40, MARK>=40, MARK>=80), but Ben's algorithm only contain 2 part, (MARK>=80; MARK>=40), if the value don't suitable for these two condition, than output 'Unattained', if it match the any one of condition, than it will output GRADE straightly. (2 marks)

2

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Answers written in the margins will not be marked.

(d) A workstation in the system provides a virtual keyboard on the screen which can be used to enter t
marks.

(i) Give one advantage and one disadvantage of this design.

Advantage: It save the space (1)

Disadvantage: If the workstation in the system have broken, then it cannot move the keyboard to the other workstation to continue work.

(ii) Suggest a common way to connect a keyboard to the workstation other than using a USB port.

The wireless connection, such as bluetooth. ✓ (1)

(iii) Mr Law wants to connect a USB printer to the workstation but the connection fails. What is the potential software problem?

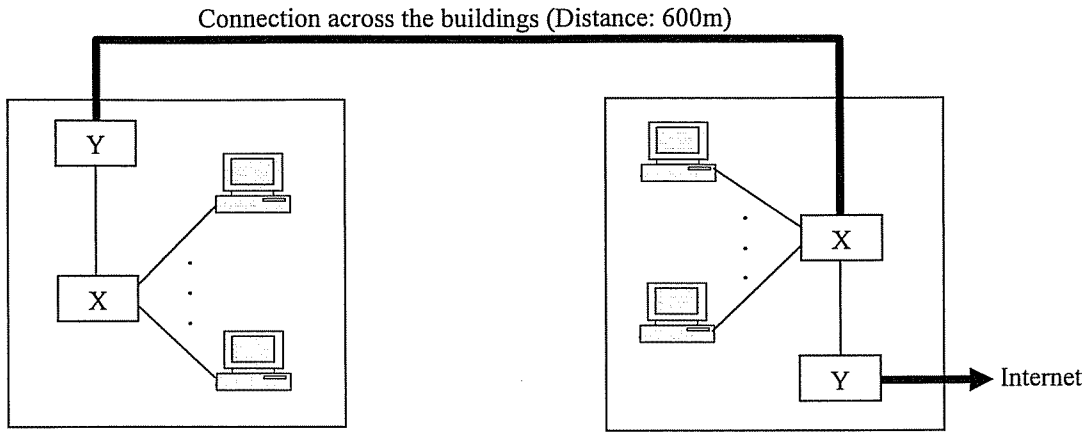
The computer don't support the installed problems of the software. ✗ 0

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. Mr Li is the IT manager of a university in Australia: On the campus there are two computer networks in Building A and Building B which are used by staff and students respectively. The two buildings are apart, as shown below.



(a) (i) What network connecting devices are X and Y?

X: switch ✓ (1) Y: router ✓ (1)

(ii) Suggest a suitable type of network cable for the connection across the buildings and justify your answer.

optical fibre as it ✓ supports long distance coverage. ✓ (1)

(iii) Instead of using a wired connection, Mr Li wants to connect two networks by installing microwave dishes on the roofs of the buildings. State **two** disadvantages of this approach.

~~[illegible]~~ ~~[illegible]~~ not stable in transmission ✓ (1)

~~[illegible]~~ ~~[illegible]~~ higher maintainance ✓ (1)

cost and set up cost.

(5 marks)

(b) Mr Li subscribes to an Internet connection. A cable modem is needed to connect the campus network to the Internet. What is the function of the cable modem?

translate the annalogue data to digital data and vice versa ✓ (2)

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) Mr Li sets up an email server in the university and offers an email account to each student. In ea following cases, which email protocol for accessing email boxes is preferable? Justify your answe

(i) Each email box only has 5 MB storage space.

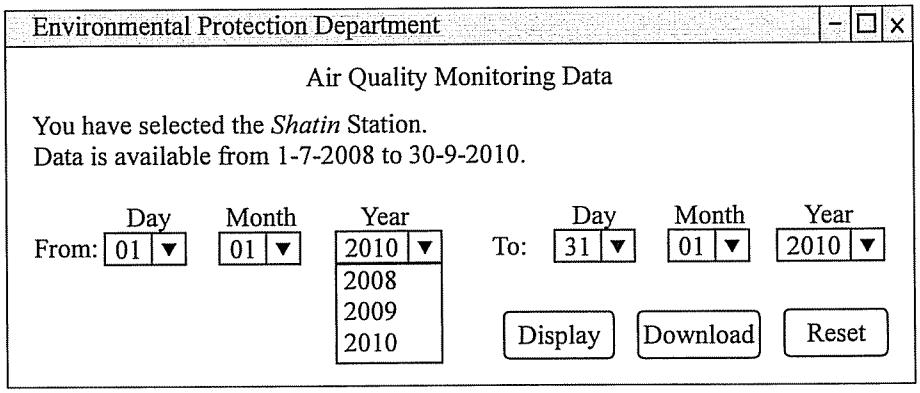
POP / It is fast to download to e-mail to check it. (1)

(ii) Students can access their email boxes through any computer with Internet access.

IMAP is preferable that students can access the email boxes online as the email is stored in the server (2)

(4 marks)

5. Peter wants to study the air quality in Shatin and Kwun Tong. He downloads the air quality monitoring data from the website of the Environmental Protection Department, as shown below:



(a) (i) In the web page above, how can the use of drop-down lists help with data input?

User no need to use keyboard input the data and prevent user input some ~~error~~ not suitable data (1)

(ii) There should be two validation rules for checking the input data. Give two different sets of **invalid** data to illustrate the need for the rules.

		Day	Month	Year		Day	Month	Year
Set 1	From:	28	5	10	To:	10	2	10
Set 2	From:	31	2	10	To:	2	3	10

(2)

(3 marks)

The readings of air pollutants, P1, P2 and P3, are collected every 6 hours. Peter downloads the data of at Shatin and Kwun Tong in January 2010 and stores them in two worksheets of a spreadsheet file, *S* and *Sheet2*, respectively. *Sheet1* is shown below.

	A	B	C	D	E	F	G
1			Time				
2	**Date**	**Pollutant**	**00 00**	**06 00**	**12 00**	**18 00**	**Average**
3	1-1-2010	P1	14	12	11	9	
4	1-1-2010	P2	116	103	102	78	
5	1-1-2010	P3	28	20	21	29	
6	2-1-2010	P1	25	18	18	26	
7	2-1-2010	P2	87	90	86	63	
8	2-1-2010	P3	10	9	9	2	
9	3-1-2010	P1	86	83	83	7	
⋮	⋮	⋮	⋮	⋮	⋮	⋮	
94	31-1-2010	P2	37	15	7	82	
95	31-1-2010	P3	4	6	12	3	
96							
97						P1 average:	

(b) Peter wants to find the average reading of P1 at Shatin in January 2010.

(i) To find the daily average readings of the pollutants everyday, a formula is entered into G3 and is then copied into G4 to G95. Write the formula in G3.

= Average (C3 : F3) ✓ (2)

(ii) Write the formula in G97 to find the average reading of P1 at Shatin in January 2010.

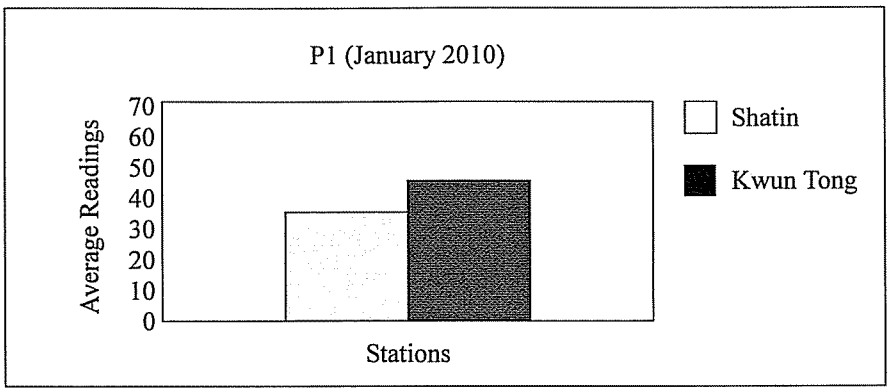
= Sumif (B3 : B95, ="P1", ($3 F$3)) / countif (B3 : B95, ="P1") ✓ (1)

(4 marks)

Answers written in the margins will not be marked.

(c) The same steps in (b) have also been applied to *Sheet2* for the data collected at Kwun Tong.

Peter creates the following chart to show the average readings of P1 at Shatin and at Kwun Tong in January 2010.



(i) Describe, with major steps, how to create the chart.

Step 1: Select the data which are going to present in chart.
Step 2: Choosing the appropriate chart.
Step 3: Follow the instructions to key in the title, keys and adjust the size of the chart. (3)

(ii) Peter copies the chart into his presentation file. Afterwards he updates some readings of P1 on *Sheet1*. Will the chart in the presentation file change accordingly? Explain briefly.

yes, because the data of chart is linked to ~~the sheet~~ sheet1 and sheet 2. (2)

(5 marks)

END OF PAPER

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Answers written in the margins will not be marked.

本試卷全部試題均須回答。

1. 黃先生負責爲一家超級市場建立庫存系統。他建立了 INVENTORY 數據庫表格來儲存產品銷售的資料。以下是 INVENTORY 的部分內容：

INVENTORY

CAT (類別)	CODE (產品代碼)	NAME (產品名稱)	PRICE (產品價格)	QTY (庫存中的數量)
飲料	B163	BEST juice	10.0	10
零食	S968	좋은감자칩	12.2	40
麵條	N042	乐乐浓汤鸡面	20.2	20
飲料	B482	FRESH tea	25.9	80
麵條	N091	QQ noodle	8.4	50

(a) 哪個欄位 CAT、CODE、NAME、PRICE 或 QTY 應作爲關鍵欄位？ CODE ✓ (1)

(1 分)

(b) QTY 的數據類型是整數，黃先生的同事小麗建議將此數據類型更改爲實數或字串。黃先生不同意小麗的建議，爲什麼？

因為 QTY 有可能是很大的數目，而整數比實數及字串可以提供更多數位的輸入。 X O

(2 分)

(c) 哪一個字符編碼系統是最適合儲存 NAME 的數據？ 試簡單解釋。

統一碼 ✓。因為 NAME 包括不同國家的文字，又有統一碼包含大部份文字編碼。 ✓ (2)

(2 分)

(d) (i) 黃先生寫了下列 SQL 指令。根據上述 INVENTORY 內五個已知的記錄，執行此查詢後的結果是什麼？

```
Select CODE, PRICE from INVENTORY where PRICE > 10 and QTY < 40
```

N042 乐乐浓汤鸡面 ✓ (1)

(ii) 現已將 INVENTORY 匯入到一個試算表內。試以步驟描述如何使用試算表軟件內的功能，提取與 (d)(i) 查詢後一樣的結果。

可使用試算表的篩選功能，將 PRICE > 10 及 QTY < 40 設定為要求，找出資料。 ✓ (2)

(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(e) 黃先生考慮以無線射頻識別 (RFID) 系統取代現有條碼系統，以便收集產品資料。試舉出使用 RFID 系統而非條碼系統的一個優點和一個缺點。

優點：讀取時間較短 ✓，方便超市。 (2)

缺點：硬件要求較高，成本較高。✓

(2 分)

2. 佩珊因工作需要而購買了一部平板電腦。該電腦的規格如下：

中央處理器	1.2 GHz 雙核心處理器
顯示器	8 吋 LED 觸控屏幕
記憶體及儲存	512 MB (ROM)，64 GB 快閃記憶體
輸入／輸出	USB 2.0，內置揚聲器
連接	Wi-Fi，藍芽
電池（續航時間）	14 小時
重量	0.5 千克
尺寸	190×130×10 毫米

(a) 試列舉這部平板電腦兩個專爲提高其流動性的特點。

尺寸較小 ✓ 只有 190×130×10 毫米，重量較輕 ✓，只有 0.54 克。 (2)

(2 分)

(b) (i) 這部平板電腦設有 64 GB 的快閃記憶體，與普通手提電腦的配置非常不同。爲什麼？

因為快閃記憶体提供速度較快的存取（相比硬碟下），✓ 平板电脑要求高的存取速度。 (1)

(ii) 應否以 SDRAM 來取代這部平板電腦內的快閃記憶體？試簡單解釋。

不應該 ✓，因為 SDRAM 的存取速度較慢，並不支援部份擴展。✗ (1)

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) 在平板電腦內 ROM 儲存的程式中，哪一個是最重要的？

操作程式 X 0

(1 分)

佩珊發現她在公司內的桌面電腦感染了電腦病毒。

(d) (i) 試列出兩種可以通過互聯網傳播電腦病毒至其他電腦的可能途徑。

透过电子邮件传送电脑病毒。✓ 在網絡上的下載網站中下載檔案附有电脑病毒。✓ (2)

(ii) 有時最先進的防病毒軟件也無法刪除一些電腦病毒。試簡單解釋這種情況。

因為电脑病毒較新建立，而防病毒軟件的病毒定義檔內並沒有該电脑病毒。✓ (1)

(3 分)

佩珊建議公司技術人員李先生，可在辦公室的電腦內安裝有 30 天試用期的照片編輯共享軟件。

(e) (i) 在安裝軟件前，李先生應了解哪個與版權有關的問題？他需閱讀哪份文件？

版權使用權限及限期，要閱讀該軟件附帶的使用條款。✓ (2)

(ii) 佩珊下載並安裝一個盜版照片編輯軟件在她的電腦內。她這樣做可會帶來什麼法律後果？

侵犯版權。X 0

(3 分)

(f) 李先生在所有電腦內安裝一個軟件，使每台電腦在每次重新啓動後自動恢復到原來的狀態。試列出這個軟件的一個優點和一個缺點。

優点是可以清除部份电脑病毒。✓ (2)

缺点是部份电脑上的暫存檔案可能因此被刪除。✓

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

3. 小翠及智仁協助羅先生設計一個電腦系統，用以尋找輸入分數之對應等級。

(a) 小翠使用以下偽代碼來展示她的算法：

```
步驟 1：輸入一個數值，並儲存在 MARK 內
步驟 2：若 MARK < 40 則 GRADE ← 'Unattained'
步驟 3：若 MARK >= 40 則 GRADE ← 'Attained'
步驟 4：若 MARK >= 80 則 GRADE ← 'Distinction'
步驟 5：輸出 GRADE
```

(i) 試就以下每個 MARK 的數值，寫出 GRADE 內的值。

(1) MARK = 40 GRADE = Attained ✓

(2) MARK = 200 GRADE = Distinction ✓

(2)

(ii) 小翠採用迭代控制結構來修改步驟 1 之偽代碼，使 MARK 值介乎 0 和 100 之間，包括首尾兩數，如下所示。

步驟 1：當 MARK 值小於 0 或大於 100，重複輸入數值至 MARK 內。

(1) 除了 0 和 100，試寫出另一個可以用來識別算法的邊際個案的測試數據。

當 MARK 值小於或等於 1 或 大於或等於 99，重複輸入MARK ✓

(2) 小翠使用了前期測試、後期測試，抑或 for 循環類型的迭代控制結構呢？

前期測試 前期測試 ✓ (1)

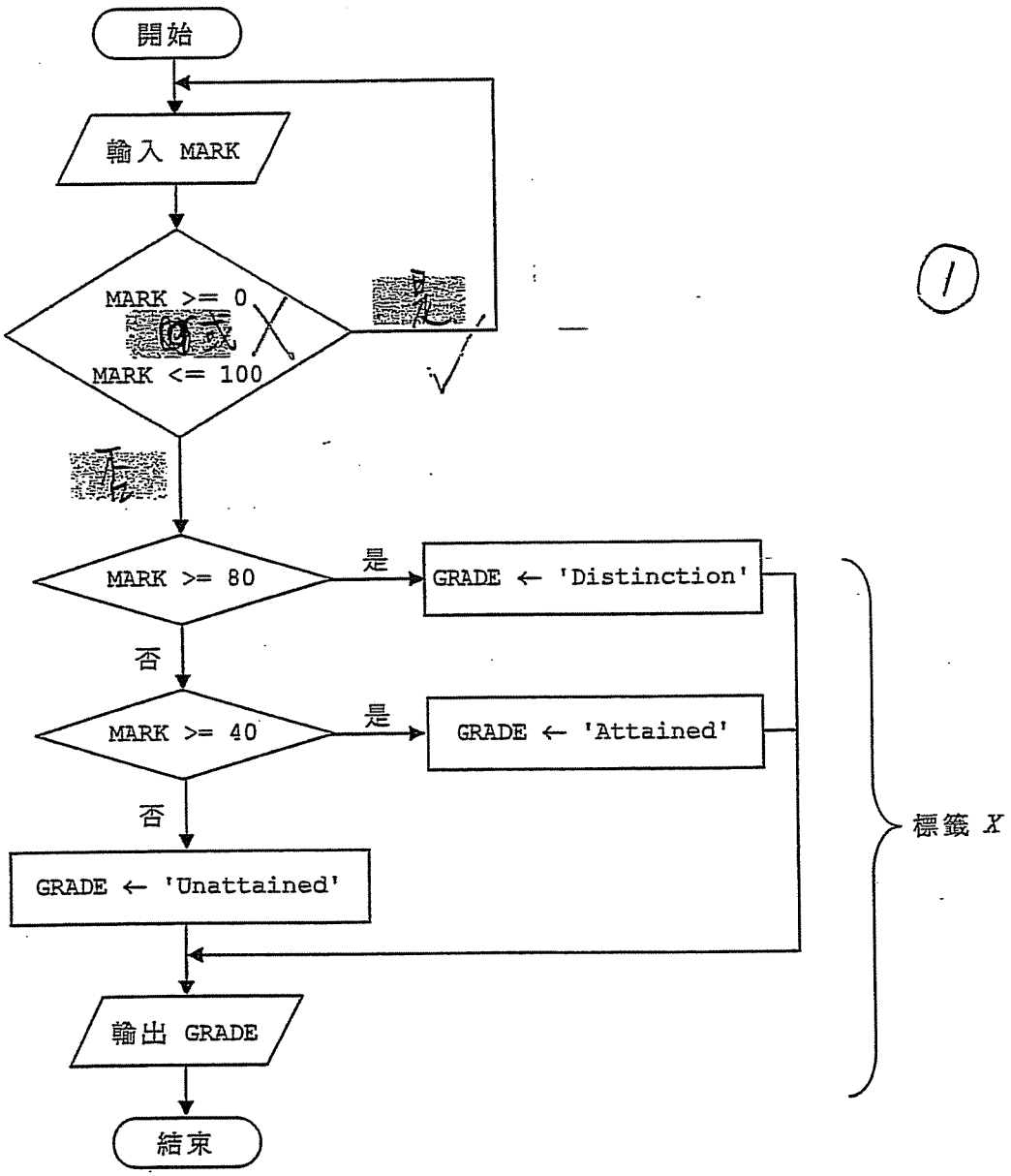
(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(b) 智仁使用下列流程圖來展示他的算法。在第一個判定框之陰影區內，填寫「是」、「否」及適合之運算符。



(2 分)

(c) 比較標籤 X 範圍內的算法與小翠的算法，哪一個更爲有效率？試簡略說明。

標籤X的算法。因為它節省最後一个步驟"若MARK>=80則GRADE←'Unattained'"，令運算速度更快。

(2 分)

寫於邊界以外的答案，將不予評閱。

(d) 此系統的工作站提供虛擬鍵盤，讓用戶在屏幕上輸入分數。

(i) 試列出這項設計的一個優點及一個缺點。

優點：節省空間。 ✓ (1)

缺點：萬遇鼠等輸入設備已經損無使用，工作站便不能輸入分數。

(ii) 除使用 USB 埠外，試建議另一個連接鍵盤到工作站的常見方案。

藍芽連接。 ✓

(iii) 羅先生打算連接一部 USB 打印機至工作站，但連線失敗。試舉出一個潛在的軟件問題。 (2)

因為工作站並沒有安裝該打印機需要的驅動程式。 ✓

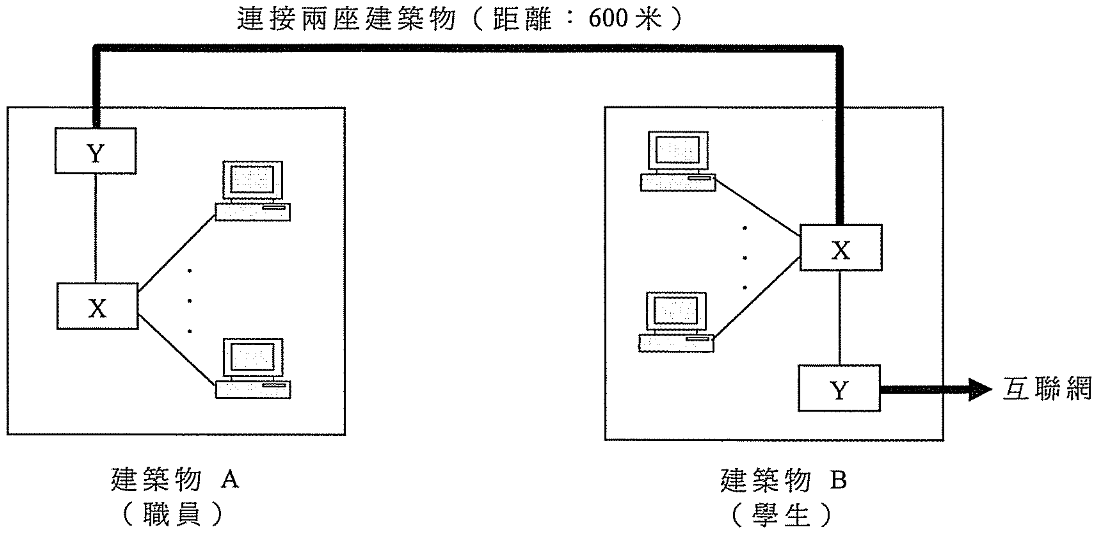
(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

4. 李先生是澳洲一間大學的 IT 經理。在校園裏有兩個電腦網絡，位於建築物 A 內，分別供職員及學生使用。兩座建築物相距 600 米，如下圖所示。



(a) (i) X 和 Y 是什麼網絡連接裝置？

X： 集線器 ①　　　　Y： 路由器 ①

(ii) 試建議適合的網絡電纜類別來連接兩座建築物，並加以說明。

光纖，可以連接超過 600米 ✓ ①

(iii) 李先生不欲使用有線連接，希望在建築物頂層安裝微波碟形天線來連接這兩個電腦網絡。試舉出這種做法的**兩個**缺點。

1. 成本高昂 ✓
2. 在惡劣天氣如下雨時信號傳送和接收會較差。✓ ②

(5 分)

(b) 李先生選用了互聯網連接服務，並需要使用電纜數據機來連接校園網絡至互聯網。此電纜數據機的功用是什麼？

將不同網絡區域的訊號相互轉換，如將數碼訊號轉為模擬訊號，或將模擬訊號轉為數碼訊號等。✓ ②

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) 李先生在大學內建立一個電子郵件伺服器，並向每名學生提供一個電子郵件帳戶。在下列每種情況下，哪一種電郵協定較適合用於接達電子郵件信箱？試加以說明。

(i) 每個電子郵件信箱只有 5 MB 的儲存空間。

POP3，可以下載到自己的電腦，減輕電子郵件信箱的儲存空間。 (2)

(ii) 學生可使用任何已連接互聯網之電腦來接達他們的電子郵件信箱。

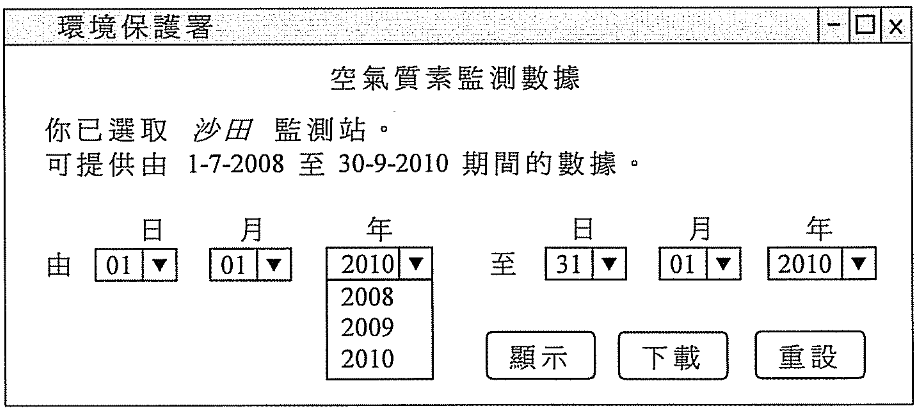
IMAP，它是电子郵件的通訊協定，学生可以透过开啟郵箱开啟电子郵件，而且伺服器中不会删除那些已讀取(储存)的郵件(已下載)，因此可以(学生)可隨時翻看郵件多次。 (2)

(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

5. 智偉打算研究在沙田及觀塘的空氣質素。他從環境保護署網站下載了空氣質素監測數據，如下所示：



(a) (i) 在以上網頁裏，下拉式清單如何協助數據輸入？

不会有輸入錯誤上的錯誤，只需在選單中尋找自己所需合適的資料便可。防止輸入選單上沒有的數值。

(ii) 這裏應有兩個有效檢驗規則用來檢查輸入的數據。試列出兩組不同的**無效**數據來說明此需要。

		日	月	年		日	月	年
第一組	由	30	9	2010	至：	1	7	2008
第二組	由	20	5	2005	至：	20	8	2012

(2)

(3 分)

寫於邊界以外的答案，將不予評閱。

每隔 6 小時空氣污染物 P1、P2 和 P3 的讀數會被收集起來。智偉下載了沙田及[illegible]在 2010 年 1 月的數據，並將它們分別儲存在兩個工作表 *Sheet1* 和 *Sheet2* 的試算的文件內。下列展示 *Sheet1* 的工作表。

	A	B	C	D	E	F	G
1			時間				
2	**日期**	**污染物**	**00 00**	**06 00**	**12 00**	**18 00**	**平均讀數**
3	1-1-2010	P1	14	12	11	9	
4	1-1-2010	P2	116	103	102	78	
5	1-1-2010	P3	28	20	21	29	
6	2-1-2010	P1	25	18	18	26	
7	2-1-2010	P2	87	90	86	63	
8	2-1-2010	P3	10	9	9	2	
9	3-1-2010	P1	86	83	83	7	
⋮	⋮	⋮	⋮	⋮	⋮	⋮	
94	31-1-2010	P2	37	15	7	82	
95	31-1-2010	P3	4	6	12	3	
96							
97						P1 平均讀數：	

(b) 智偉打算找出 2010 年 1 月沙田的 P1 平均讀數。

(i) 在 G3 輸入一條公式，並複製到 G4 至 G95，這樣便可找出各種污染物的每日平均讀數。試寫出 G3 的公式。

=AVERAGE(C3:F3) ✓ (2)

(ii) 試寫出 G97 的公式，以便找出 2010 年 1 月沙田的 P1 平均讀數。

=SUMIF($G$3:$G$95, $B$3:$B$95="P1") / (1)
COUNTIF($B$3:$B$95, P1) ✓ (4 分)

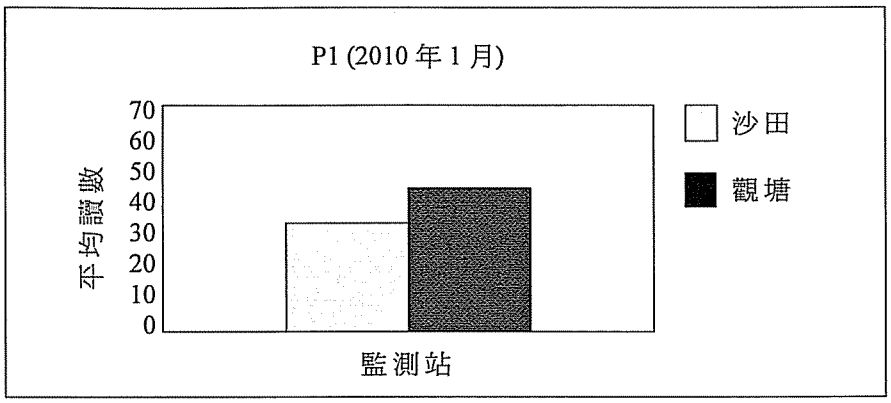
寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) *Sheet2* 工作表也採用與 (b) 部相同的步驟，處理了在觀塘所收集的數據。

智偉建立以下圖表，展示在 2010 年 1 月分別於沙田及觀塘的 P1 平均讀數。



(i) 試以主要步驟描述如何建立此圖表。

首選擇試算表建立圖表的按鈕並選擇橫條形圖，然後選擇 Sheet1 和 Sheet2 中 P1 平均讀數的儲存格作為橫條數據，最後加上標題、橫軸縱軸的標題和兩條橫代表的地方。 (3)

(ii) 智偉複製此圖表至他的演示文件內。後來他在 *Sheet1* 中更新某些 P1 的讀數。這個演示文件中的圖表會否有相應的變化？試簡略解釋。

不會，因為智偉是複製圖表，因此圖表成為了一幅圖像，如果智偉是超連結，因此智偉在 Sheet 作出的更新並不能使圖像同步更新。 (2)

(5 分)

試卷完

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

Answer all questions.

1. Mr Wong is responsible for setting up an inventory system in a supermarket. He creates a database table, INVENTORY, to store the information on products for sale. Part of INVENTORY is shown below:

INVENTORY

CAT (Category)	CODE (Product code)	NAME (Product Name)	PRICE (Price of product)	QTY (Number of items in stock)
Beverage	B163	BEST juice	10.0	10
Snack	S968	좋은감자칩	12.2	40
Noodle	N042	乐乐浓汤鸡面	20.2	20
Beverage	B482	FRESH tea	25.9	80
Noodle	N091	QQ noodle	8.4	50

(a) Which field, CAT, CODE, NAME, PRICE or QTY, should be used as a key field? CODE (1)

(1 mark)

(b) The data type of QTY is integer. Judy, Mr Wong's colleague, suggests changing it to real number or string. Mr Wong disagrees with Judy's suggestion. Why?

It's because the number in the columns of "QTY" is only a displayed numeric values. They aren't for caculations. If they are changed to real number or string, there may have some syntax errors occur and inputted data may not be available. 0

(2 marks)

(c) For storing data under NAME, which character encoding system is most suitable? Explain briefly.

Unicode is most suitable. It's because it supports wide range of languages. As the names of the product are different in languages like Korean and English, unicode supports all this languages. (2)

(2 marks)

(d) (i) Mr Wong writes the following SQL command. Based on the five given records in INVENTORY above, what is the query result?

```
Select CODE, PRICE from INVENTORY where PRICE > 10 and QTY < 40
```

N042 20.2 (2)

(ii) INVENTORY is imported into a spreadsheet file. Describe, with steps, how to use the functions of spreadsheet software to extract the same data as the query result in (d)(i).

First, there should be a cell for creating the formula in(d)(i), then write =IF("PRICE">10" AND QTY<"40", B1 AND D2) 0

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode la

(e) Mr Wong considers replacing the existing barcode system with a Radio Frequency Identification (RFID) system, to capture product information. State one advantage and one disadvantage of using the RFID system over the barcode system.

Advantage: high Security for protecting the goods from being stolen

Disadvantage: need lots of time to stick the RFID tags on the products and the set up costs is high

(2 marks)

2. Susan buys a tablet PC for her work. The specifications of the PC are shown below.

CPU	1.2 GHz dual-core processor
Display unit	8-inch LED touch screen
Memory and storage	512 MB (ROM), 64 GB flash memory
Input / Output	USB 2.0, Built-in speaker
Connectivity	Wi-Fi, Bluetooth
Battery (life time)	14 hours
Weight	0.5 kg
Dimension	190×130×10 mm

(a) State **two** features of the tablet PC that are mainly designed for mobility.

light weight and portable, usually with the wireless connection.

(2 marks)

(b) (i) The tablet PC has 64 GB flash memory installed, which is quite different from an ordinary notebook computer. Why?

The storage space of the tablet PC is higher than that of the original notebook computer. It is because it's for business users.

(ii) Should SDRAM replace the flash memory in the tablet PC? Explain briefly.

Yes. SDRAM is cheaper than that of the flash memory. Also, it is higher secure than the flash memory and its accessibility is higher.

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) What is the most important program stored in the ROM of the tablet PC?

Operating System. X 0

(1 mark)

Susan finds that her desktop computer at work is infected with a computer virus.

(d) (i) State **two** possible ways that the computer virus can be spread to other computers through the Internet.

the computer virus can be spread by sending the e-mails ✓
automatically to the receivers in the mail list of the victims. Also
it can be spread by posting the ads on the Internet. ✓ (2)

(ii) Sometimes even state-of-the-art antivirus software cannot remove some computer viruses. Explain briefly why this is the case.

It's because the virus definition file has not been updated
frequently. ✓ (1)

(3 marks)

Susan suggests that Patrick, a technician in the company, install photo editing shareware with a 30-day trial period on the office computers.

(e) (i) Before the installation, what copyright issue should Patrick know about? What document should he read?

He should know that after 30-days trial period, he had to buy the
premium one. He should read the details of use and regulations
information. (1)

(ii) Susan downloads and installs a pirated copy of photo editing software on her computer. What is the possible legal consequence of her action?

she will be arrested for downloading this pirated software. (1)

(3 marks)

(f) Patrick installs a software package on all computers such that the system in each computer will be automatically restored to its original state on every reboot. Give one advantage and one disadvantage of this software package.

Advantage: it is secure to install the software package on all
computers as to prevent
disadvantage: use lots of time to install the software package
to every computer. 0

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode lab

3. Mr Law develops a computer system with the help of Ada and Ben. The system is used to find the equivalent grade for an input mark.

(a) Ada uses the following pseudocode to represent her algorithm.

```
Step 1: Input a value into MARK
Step 2: If MARK < 40 Then GRADE ← 'Unattained'
Step 3: If MARK >= 40 Then GRADE ← 'Attained'
Step 4: If MARK >= 80 Then GRADE ← 'Distinction'
Step 5: Output GRADE
```

(i) What is the value of GRADE for each of the following values of MARK?

(1) MARK = 40 GRADE = 'Attained' ✓ (1)

(2) MARK = 200 GRADE = ERROR ✗

(ii) Ada modifies the pseudocode by applying iteration control structure in Step 1 so that the value of MARK is between 0 and 100 inclusive as shown below.

Step 1: Repeat the input of values into MARK when the value of MARK is smaller than 0 or larger than 100

(1) Other than 0 and 100, give another test datum that can be used to identify the boundary cases of the algorithm.

50 and 80 ✗

(2) Which type of iteration control structure, pre-test, post-test or for loop, is used by Ada?

post-test ✓ (1)

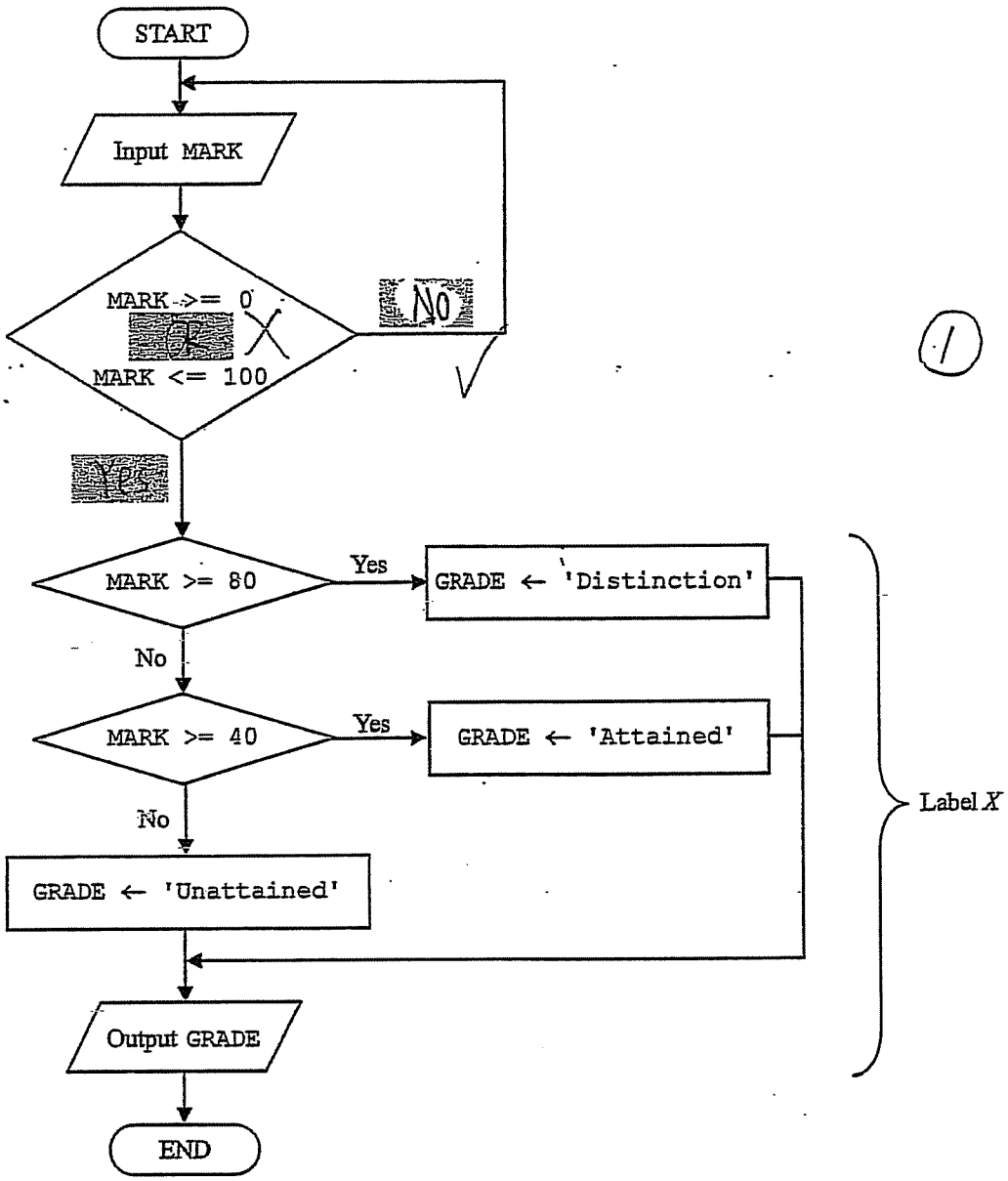
(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) Ben uses the following flowchart to represent his algorithm. Write down YES, NO and an appropriate operator in the shaded areas for the first decision box.



(2 marks)

(c) Compare the algorithm indicated by Label *X* with Ada's algorithm. Which one is more efficient? Explain briefly.

Label X is more efficient. It's because Label X has used the For loop to test the algorithm and this will repeatedly doing the jobs until all the data has been tested. For Ada's, it could not do that.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(d) A workstation in the system provides a virtual keyboard on the screen which can be used to enter marks.

(i) Give one advantage and one disadvantage of this design.

Advantage: It is more advanced and modern and it enhance the input efficiency of the marks

Disadvantage: the cost of setting up this kind of system is usually high and expensive.

(ii) Suggest a common way to connect a keyboard to the workstation other than using a USB port. (1)

use wireless keyboard through build up a common wirtless network or blue-tooth.

(iii) Mr Law wants to connect a USB printer to the workstation but the connection fails. What is the potential software problem?

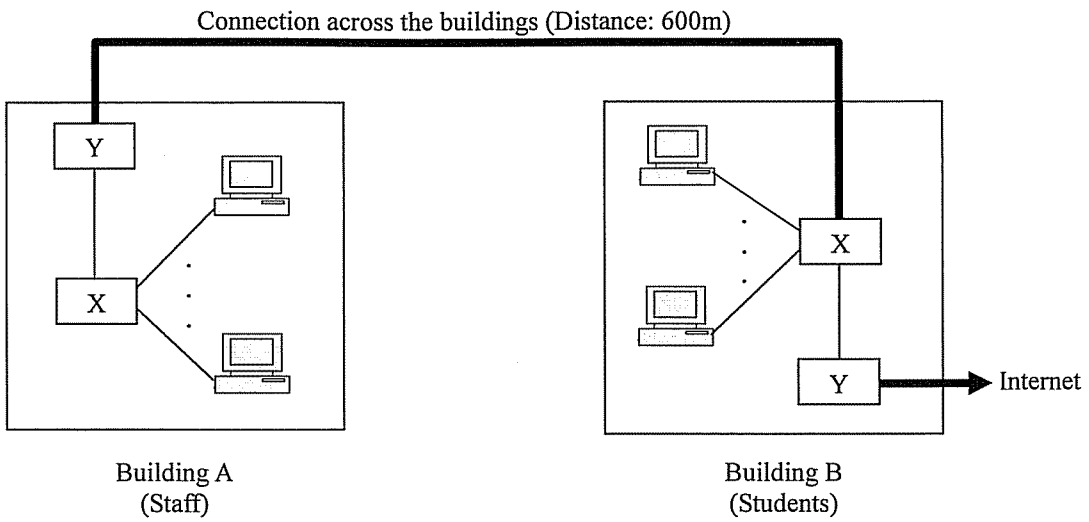
He needs a driver software of the ~~th~~ USB priter ~~to~~ then, he ~~can~~ can install the program to connect the USB printer.

(4 marks) (1)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. Mr Li is the IT manager of a university in Australia. On the campus there are two computer networks in Building A and Building B which are used by staff and students respectively. The two buildings are apart, as shown below.



(a) (i) What network connecting devices are X and Y?

X: Switch ✓ (1) Y: modem ✗

(ii) Suggest a suitable type of network cable for the connection across the buildings and justify your answer.

Optical fibre can be used as network cable. It is because the distance between connection across building is long and optical fibre can send signal in a long transmission distance at a faster rate. (1)

(iii) Instead of using a wired connection, Mr Li wants to connect two networks by installing microwave dishes on the roofs of the buildings. State **two** disadvantages of this approach.

Some files will be stolen by hacker. ✓ (1) It will delay the connecting. ✗

(5 marks)

(b) Mr Li subscribes to an Internet connection. A cable modem is needed to connect the campus network to the Internet. What is the function of the cable modem?

To link up with the Internet. Upload and download the data. ✗ For transmission of data.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) Mr Li sets up an email server in the university and offers an email account to each student. In ea following cases, which email protocol for accessing email boxes is preferable? Justify your answ

(i) Each email box only has 5 MB storage space.

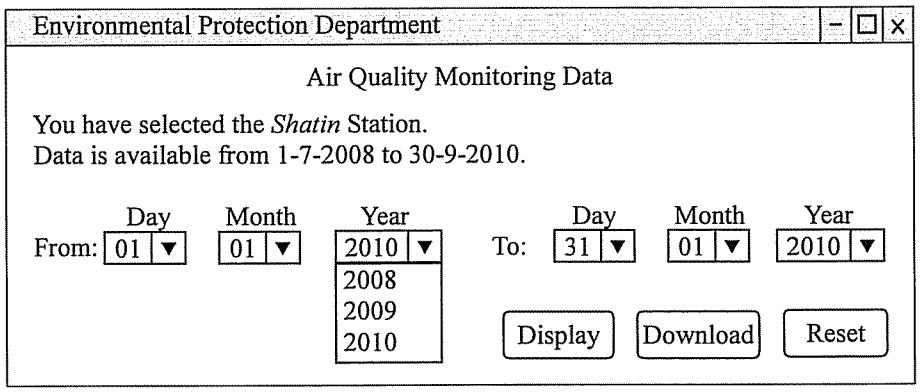
POP3 is more preferable since it supports data transfer through the internet in larger size. (1)

(ii) Students can access their email boxes through any computer with Internet access.

IMAP is more preferable since it is more popular in the Internet and computer which allows user to use at everywhere (1)

(4 marks)

5. Peter wants to study the air quality in Shatin and Kwun Tong. He downloads the air quality monitoring data from the website of the Environmental Protection Department, as shown below:



(a) (i) In the web page above, how can the use of drop-down lists help with data input?

It limits the options of each data and prevent invalid data inputted. (1)

(ii) There should be two validation rules for checking the input data. Give two different sets of **invalid** data to illustrate the need for the rules.

		Day	Month	Year		Day	Month	Year
Set 1	From:	01	01	1900	To:	02	02	2001
Set 2	From:	01	01	2010	To:	02	02	2001

(1) ✓ ✗

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

The readings of air pollutants, P1, P2 and P3, are collected every 6 hours. Peter downloads the data of at Shatin and Kwun Tong in January 2010 and stores them in two worksheets of a spreadsheet file, *Sheet1* and *Sheet2*, respectively. *Sheet1* is shown below.

	A	B	C	D	E	F	G
1			Time				
2	**Date**	**Pollutant**	**00 00**	**06 00**	**12 00**	**18 00**	**Average**
3	1-1-2010	P1	14	12	11	9	
4	1-1-2010	P2	116	103	102	78	
5	1-1-2010	P3	28	20	21	29	
6	2-1-2010	P1	25	18	18	26	
7	2-1-2010	P2	87	90	86	63	
8	2-1-2010	P3	10	9	9	2	
9	3-1-2010	P1	86	83	83	7	
⋮	⋮	⋮	⋮	⋮	⋮	⋮	
94	31-1-2010	P2	37	15	7	82	
95	31-1-2010	P3	4	6	12	3	
96							
97						P1 average:	

(b) Peter wants to find the average reading of P1 at Shatin in January 2010.

(i) To find the daily average readings of the pollutants everyday, a formula is entered into `G3` and is then copied into `G4` to `G95`. Write the formula in `G3`.

= sum(C3:F3) ✗ (1)

(ii) Write the formula in `G97` to find the average reading of P1 at Shatin in January 2010.

=SUMIF($F$3:$F$95, B3:B95 = "P1")/31 (1)

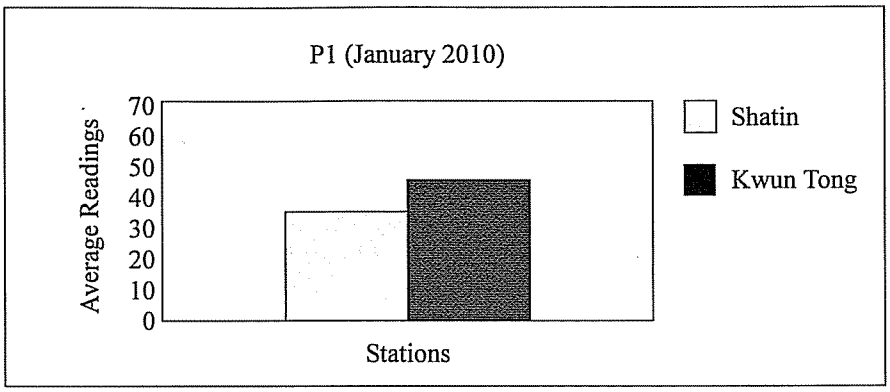
(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) The same steps in (b) have also been applied to *Sheet2* for the data collected at Kwun Tong.

Peter creates the following chart to show the average readings of P1 at Shatin and at Kwun Tong in January 2010.



(i) Describe, with major steps, how to create the chart.

Use the spreadsheet programm, first input the table, and press the chart function, and select what type of chart you want to use, and confirm that after started. Then you can see the change

(ii) Peter copies the chart into his presentation file. Afterwards he updates some readings of P1 on *Sheet1*. Will the chart in the presentation file change accordingly? Explain briefly.

No. Because he has copy the data of the chart, it is just a picture only. It has embedded to his presentation file, so it will not have any change of the data.

(5 marks)

END OF PAPER

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

本試卷全部試題均須回答。

1. 黃先生負責爲一家超級市場建立庫存系統。他建立了 INVENTORY 數據庫表格來儲存產品銷售的資料。以下是 INVENTORY 的部分內容：

INVENTORY

CAT (類別)	CODE (產品代碼)	NAME (產品名稱)	PRICE (產品價格)	QTY (庫存中的數量)
飲料	B163	BEST juice	10.0	10
零食	S968	종은감자칩	12.2	40
麵條	N042	乐乐浓汤鸡面	20.2	20
飲料	B482	FRESH tea	25.9	80
麵條	N091	QQ noodle	8.4	50

(1)

(a) 哪個欄位 CAT、CODE、NAME、PRICE 或 QTY 應作爲關鍵欄位？ CODE ✓

(1 分)

(b) QTY 的數據類型是整數，黃先生的同事小麗建議將此數據類型更改爲實數或字串。黃先生不同意小麗的建議，爲什麼？

因爲來源是以整數進入，如用實數便需要經常更改。X 0

(2 分)

(c) 哪一個字符編碼系統是最適合儲存 NAME 的數據？試簡單解釋。

Unicode ✓ 因爲包含不同國家的字體 ✓ (2)

(2 分)

(d) (i) 黃先生寫了下列 SQL 指令。根據上述 INVENTORY 內五個已知的記錄，執行此查詢後的結果是什麼？

```
Select CODE, PRICE from INVENTORY where PRICE > 10 and QTY < 40
```

麵條 N042 ✓ 乐乐浓汤鸡面 20.2 20 (1)

(ii) 現已將 INVENTORY 匯入到一個試算表內。試以步驟描述如何使用試算表軟件內的功能，提取與 (d)(i) 查詢後一樣的結果。

首先，把所有資料輸入到試算表內，然後 0
走空白的一格內輸入 Find(CODE>10, QTY<40) ✓

(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

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(e) 黃先生考慮以無線射頻識別 (RFID) 系統取代現有條碼系統，以便收集產品資料。試舉出使用 RFID 系統而非條碼系統的一個優點和一個缺點。

優點：點貨方便可以更快速 ✓ (1)

缺點：~~當竊賊有~~保安上有很大問題，客顧客能輕易地把無線射頻識別拆下。 ✗

(2 分)

2. 佩珊因工作需要而購買了一部平板電腦。該電腦的規格如下：

中央處理器	1.2 GHz 雙核心處理器 ✓
顯示器	8 吋 LED 觸控屏幕
記憶體及儲存	512 MB (ROM)，64 GB 快閃記憶體 ✓
輸入／輸出	USB 2.0，內置揚聲器 ✗
連接	Wi-Fi，藍芽
電池（續航時間）	14 小時
重量	0.5 千克
尺寸	190×130×10 毫米

(a) 試列舉這部平板電腦**兩個**專為提高其流動性的特點。

-1.2GHz 双核心處理器 ✗

~~512MB (ROM) 64GB 快閃記憶體~~ 有WiFi和藍芽隨時隨地可以使用 ✓ (1)

(2 分)

(b) (i) 這部平板電腦設有 64 GB 的快閃記憶體，與普通手提電腦的配置非常不同。為什麼？

容量比普通手提多 ✗，因為平板电腦和普通手提都只用於可攜式，不須太多容量。 (0)

(ii) 應否以 SDRAM 來取代這部平板電腦內的快閃記憶體？試簡單解釋。

不應該 ✓ 因為 SDRAM 體比快閃記憶體的體積大。 ✗ (1)

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) 在平板電腦內 ROM 儲存的程式中，哪一個是最重要的？

啓動程序 ✓ ①

(1 分)

佩珊發現她在公司內的桌面電腦感染了電腦病毒。

(d) (i) 試列出**兩**種可以通過互聯網傳播電腦病毒至其他電腦的可能途徑。

~~USB~~ 把USB記憶棒在有毒的电腦插在另一部电腦。✗ ①

轉發有毒的电子郵件到其他电腦，都会傳播电腦病毒。✓

(ii) 有時最先進的防病毒軟件也無法刪除一些電腦病毒。試簡單解釋這種情況。

如有毒程式不刪除就不能刪除病毒。✗ 0

(3 分)

佩珊建議公司技術人員李先生，可在辦公室的電腦內安裝有 30 天試用期的照片編輯共享軟件。

(e) (i) 在安裝軟件前，李先生應了解哪個與版權有關的問題？他需閱讀哪份文件？

李先生應了解照片編輯共享軟件公司的版權問題，應閱讀合約那部份 ✓ ①

(ii) 佩珊下載並安裝一個盜版照片編輯軟件在她的電腦內。她這樣做可會帶來什麼法律後果？

這樣是侵犯版權的法律，会帶來監禁和罰款 ✓ ①

(3 分)

(f) 李先生在所有電腦內安裝一個軟件，使每台電腦在每次重新啓動後自動恢復到原來的狀態。試列出這個軟件的一個優點和一個缺點。

優點：不会有任何記錄存在电腦中，即时病毒不會停留在电腦中。✓ ②

缺點：用戶不能存檔案在該电腦，如不慎会丟失檔案 ✓

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

請在此貼上電腦條

3. 小翠及智仁協助羅先生設計一個電腦系統，用以尋找輸入分數之對應等級。

(a) 小翠使用以下偽代碼來展示她的算法：

```
步驟 1：輸入一個數值，並儲存在 MARK 內
步驟 2：若 MARK < 40 則 GRADE ← 'Unattained'
步驟 3：若 MARK >= 40 則 GRADE ← 'Attained'
步驟 4：若 MARK >= 80 則 GRADE ← 'Distinction'
步驟 5：輸出 GRADE
```

(i) 試就以下每個 MARK 的數值，寫出 GRADE 內的值。

(1) MARK = 40 GRADE = Attained ✓

(2) MARK = 200 GRADE = Distinction ✓

2

(ii) 小翠採用迭代控制結構來修改步驟 1 之偽代碼，使 MARK 值介乎 0 和 100 之間，包括首尾兩數，如下所示。

步驟 1：當 MARK 值小於 0 或大於 100，重複輸入數值至 MARK 內。

(1) 除了 0 和 100，試寫出另一個可以用來識別算法的邊際個案的測試數據。

~~PASS or FAIL~~ X

(2) 小翠使用了前期測試、後期測試，抑或 for 循環類型的迭代控制結構呢？

循環類型 X 0

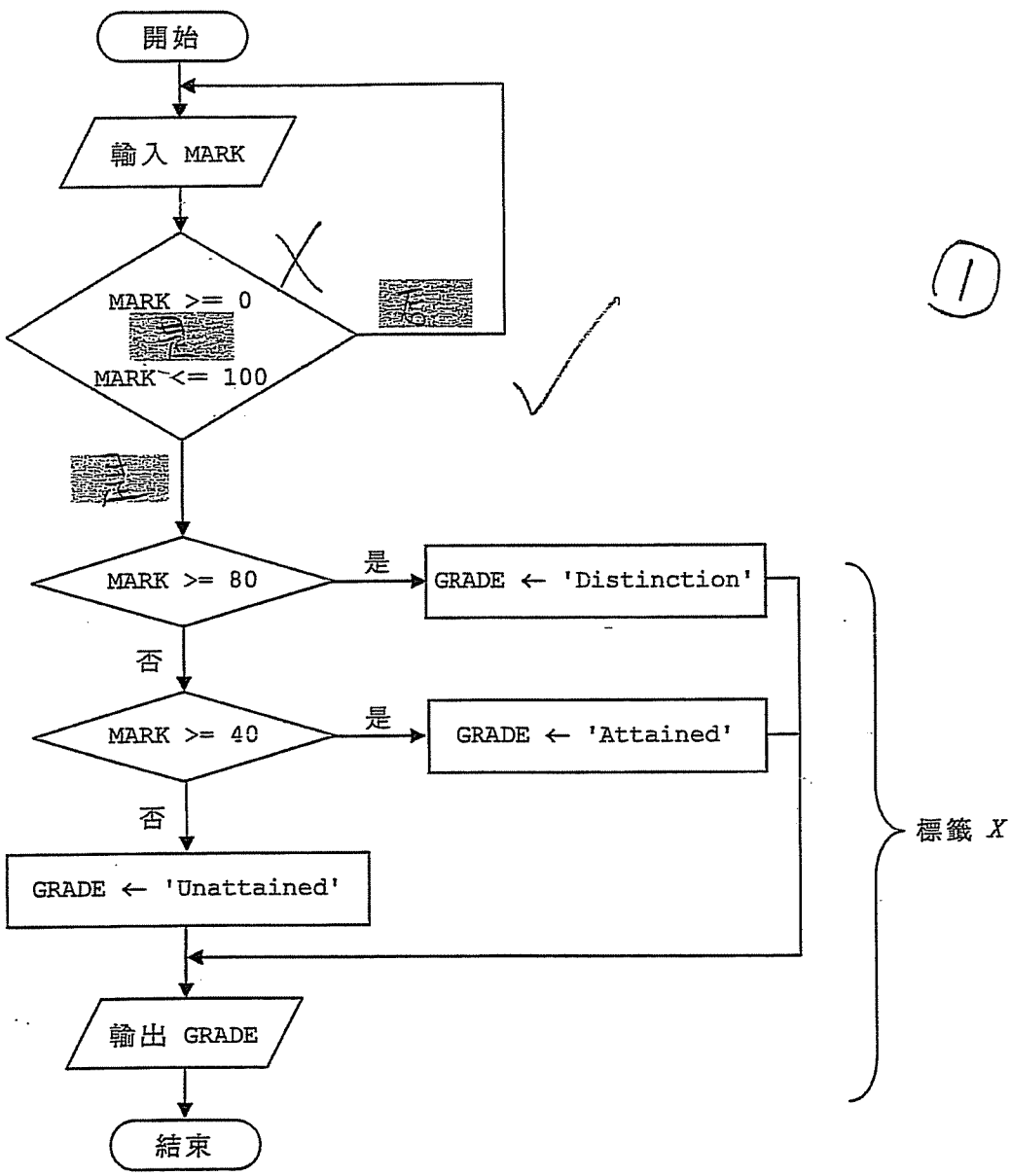
(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(b) 智仁使用下列流程圖來展示他的算法。在第一個判定框之陰影區內，填寫「是」、「否」及適合之運算符。



(2 分)

(c) 比較標籤 X 範圍內的算法與小翠的算法，哪一個更爲有效率？試簡略說明。

智仁，因爲 ~~0<=MARK<=100~~ 0>MARK或MARK>100的話就結束運算，所以比小翠寫易找到出錯位。

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(d) 此系統的工作站提供虛擬鍵盤，讓用戶在屏幕上輸入分數。

(i) 試列出這項設計的一個優點及一個缺點。

優點：使這系統更有效率。X

缺點：輸入虛擬鍵盤上容易出錯。X

(ii) 除使用 USB 埠外，試建議另一個連接鍵盤到工作站的常見方案。 (1)

還可以使用藍芽連接到鍵盤。✓

(iii) 羅先生打算連接一部 USB 打印機至工作站，但連線失敗。試舉出一個潛在的軟件問題。

可能工作站未安裝打印机的驅動程式。✓ (1)

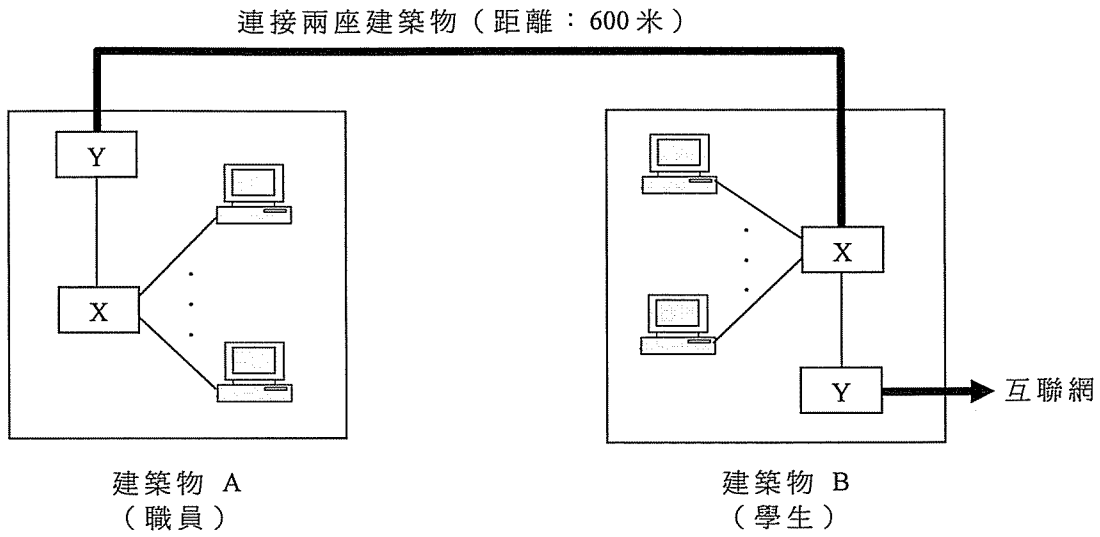
(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

4. 李先生是澳洲一間大學的 IT 經理。在校園裏有兩個電腦網絡，位於建築物 A 內，分別供職員及學生使用。兩座建築物相距 600 米，如下圖所示。



(a) (i) X 和 Y 是什麼網絡連接裝置？

X：路由器 ✗　　Y：路由器 ✓ (1)

(ii) 試建議適合的網絡電纜類別來連接兩座建築物，並加以說明。

光纖，可以連接超過 600 米 ✓ (1)

(iii) 李先生不欲使用有線連接，希望在建築物頂層安裝微波碟形天線來連接這兩個電腦網絡。試舉出這種做法的**兩個**缺點。

缺點：① 下雨行雷閃电時容易到微波碟形天線，可能会出現干擾而導致電腦不能連至網絡。 ✗ (1)
② 所需的成本高 ✓

(5 分)

(b) 李先生選用了互聯網連接服務，並需要使用電纜數據機來連接校園網絡至互聯網。此電纜數據機的功用是什麼？

透過此電纜數據機能夠讓校園網絡連接上互聯網，功用是轉換器。 ✗

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) 李先生在大學內建立一個電子郵件伺服器，並向每名學生提供一個電子郵件戶。在下列每種情況下，哪一種電郵協定較適合用於接達電子郵件信箱？試以說明。

(i) 每個電子郵件信箱只有 5 MB 的儲存空間。

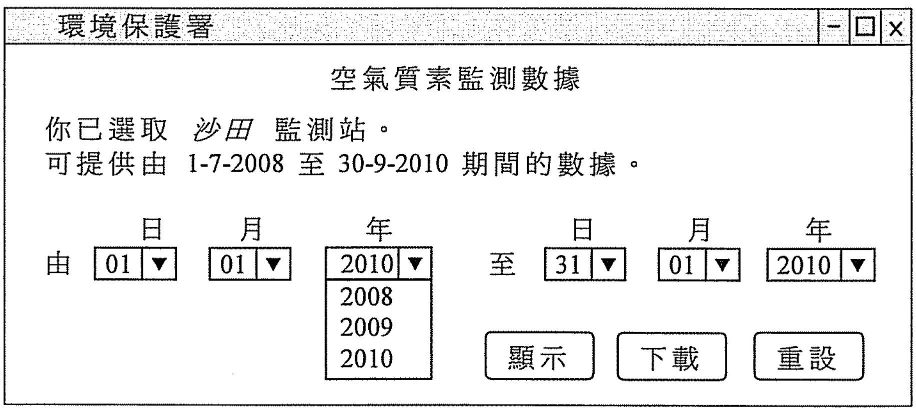
POP3 ✓ (1)

(ii) 學生可使用任何已連接互聯網之電腦來接達他們的電子郵件信箱。

IMAP，因为 IMAP 提供更广泛的连接范围，学生能於不同地方透过互联网连接伺服器。✗ (1)

(4 分)

5. 智偉打算研究在沙田及觀塘的空氣質素。他從環境保護署網站下載了空氣質素監測數據，如下所示：



(a) (i) 在以上網頁裏，下拉式清單如何協助數據輸入？

下拉式清单把相关日期包括在内，省卻打错机会。 (1)

(ii) 這裏應有兩個有效檢驗規則用來檢查輸入的數據。試列出兩組不同的**無效**數據來說明此需要。

第一組

	日	月	年		日	月	年
由	01	06	2008	至：	30	09	2010

第二組

	日	月	年		日	月	年
由	01	07	2008	至：	30	12	2010

(1)

(3 分)

寫於邊界以外的答案，將不予評閱。

每隔 6 小時空氣污染物 P1、P2 和 P3 的讀數會被收集起來。智偉下載了沙田及[illegible]在 2010 年 1 月的數據，並將它們分別儲存在兩個工作表 *Sheet1* 和 *Sheet2* 的試算[illegible]的文件內。下列展示 *Sheet1* 的工作表。

	A	B	C	D	E	F	G
1			時間				
2	**日期**	**污染物**	**00 00**	**06 00**	**12 00**	**18 00**	**平均讀數**
3	1-1-2010	P1	14	12	11	9	
4	1-1-2010	P2	116	103	102	78	
5	1-1-2010	P3	28	20	21	29	
6	2-1-2010	P1	25	18	18	26	
7	2-1-2010	P2	87	90	86	63	
8	2-1-2010	P3	10	9	9	2	
9	3-1-2010	P1	86	83	83	7	
⋮	⋮	⋮	⋮	⋮	⋮	⋮	
94	31-1-2010	P2	37	15	7	82	
95	31-1-2010	P3	4	6	12	3	
96							
97						P1 平均讀數：	

(b) 智偉打算找出 2010 年 1 月沙田的 P1 平均讀數。

(i) 在 G3 輸入一條公式，並複製到 G4 至 G95，這樣便可找出各種污染物的每日平均讀數。試寫出 G3 的公式。

=AVERAGE($C3:$F3) (1)

(ii) 試寫出 G97 的公式，以便找出 2010 年 1 月沙田的 P1 平均讀數。

~~AVERAGEIF(P1,B3:B95,G3:G95)~~

=AVERAGE(SUMIF(B3=B95,P1,G3:G95)) (1)

(4 分)

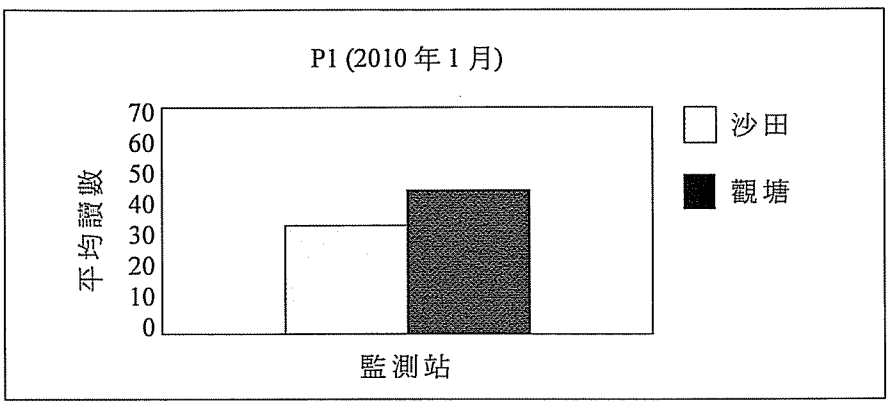
寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) *Sheet2* 工作表也採用與 (b) 部相同的步驟，處理了在觀塘所收集的數據。

智偉建立以下圖表，展示在 2010 年 1 月分別於沙田及觀塘的 P1 平均讀數。



(i) 試以主要步驟描述如何建立此圖表。

用滑鼠左鍵點選所有關於P1資料，再按右鍵，建立圖表，打入標題。選取棒形圖 (2)

(ii) 智偉複製此圖表至他的演示文件內。後來他在 *Sheet1* 中更新某些 P1 的讀數。這個演示文件中的圖表會否有相應的變化？試簡略解釋。

會。因為它是相對路徑，而非絕對路徑，當數值有變時，圖表也隨之而改變。

(5 分)

試卷完

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

Answer all questions.

1. Mr Wong is responsible for setting up an inventory system in a supermarket. He creates a database table, INVENTORY, to store the information on products for sale. Part of INVENTORY is shown below:

INVENTORY

CAT (Category)	CODE (Product code)	NAME (Product Name)	PRICE (Price of product)	QTY (Number of items in stock)
Beverage	B163	BEST juice	10.0	10
Snack	S968	좋은감자칩	12.2	40
Noodle	N042	乐乐浓汤鸡面	20.2	20
Beverage	B482	FRESH tea	25.9	80
Noodle	N091	QQ noodle	8.4	50

(a) Which field, CAT, CODE, NAME, PRICE or QTY, should be used as a key field? CODE ✓ (1)

(1 mark)

(b) The data type of QTY is integer. Judy, Mr Wong's colleague, suggests changing it to real number or string. Mr Wong disagrees with Judy's suggestion. Why?

Because QTY all is real ✗ number. (0)

(2 marks)

(c) For storing data under NAME, which character encoding system is most suitable? Explain briefly.

CODE ✗ because it is read by computer and it is key field which is unique (0)

(2 marks)

(d) (i) Mr Wong writes the following SQL command. Based on the five given records in INVENTORY above, what is the query result?

```
Select CODE, PRICE from INVENTORY where PRICE > 10 and QTY < 40
```

N042 ✓ 25.9 ✗ (1)

(ii) INVENTORY is imported into a spreadsheet file. Describe, with steps, how to use the functions of spreadsheet software to extract the same data as the query result in (d)(i).

Macro ✗ is perform the same task. (0)
↑ used to

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode l

(e) Mr Wong considers replacing the existing barcode system with a Radio Frequency Identification (RFID) system, to capture product information. State one advantage and one disadvantage of using the RFID system over the barcode system.

Advantage: read faster ✓ (1)

Disadvantage: technology is higher ✗ so difficult to use.

(2 marks)

2. Susan buys a tablet PC for her work. The specifications of the PC are shown below.

CPU	1.2 GHz dual-core processor
Display unit	8-inch LED touch screen
Memory and storage	512 MB (ROM), 64 GB flash memory
Input / Output	USB 2.0, Built-in speaker
Connectivity	Wi-Fi, Bluetooth
Battery (life time)	14 hours
Weight	0.5 kg
Dimension	190×130×10 mm

(a) State **two** features of the tablet PC that are mainly designed for mobility.

Weight ✓ (2)

Connectivity ✓

(2 marks)

(b) (i) The tablet PC has 64 GB flash memory installed, which is quite different from an ordinary notebook computer. Why?

The memory card storage is bigger ✗ than notebook computer 0

size of tablet PC

(ii) Should SDRAM replace the flash memory in the tablet PC? Explain briefly.

should not ✓ it just replace the hard disk ✗ (1)

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) What is the most important program stored in the ROM of the tablet PC?

OS X 0

(1 mark)

Susan finds that her desktop computer at work is infected with a computer virus.

(d) (i) State **two** possible ways that the computer virus can be spread to other computers through the Internet.

When Susan send e-mail, the virus can be sent with the email. (1)

When Susan use a USB flash drive, virus can be saved in the USB flas drive, if she use this drive to an other computer that will be spread

(ii) Sometimes even state-of-the-art antivirus software cannot remove some computer viruses. Explain briefly why this is the case.

The virus database of the antivirus software have not the code of virus, so the software will think some virus is a common file. (1)

(3 marks)

Susan suggests that Patrick, a technician in the company, install photo editing shareware with a 30-day trial period on the office computers.

(e) (i) Before the installation, what copyright issue should Patrick know about? What document should he read?

He should read some law of copyright issue X etc 0

(ii) Susan downloads and installs a pirated copy of photo editing software on her computer. What is the possible legal consequence of her action?

copyright X 0

(3 marks)

(f) Patrick installs a software package on all computers such that the system in each computer will be automatically restored to its original state on every reboot. Give one advantage and one disadvantage of this software package.

advantage is that the documents X have better organize. 0

disadvantage is that Reading document' time X are longer.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode la

3. Mr Law develops a computer system with the help of Ada and Ben. The system is used to find the equivalent grade for an input mark.

(a) Ada uses the following pseudocode to represent her algorithm.

Step 1: Input a value into MARK

Step 2: If MARK < 40 Then GRADE ← 'Unattained'

Step 3: If MARK >= 40 Then GRADE ← 'Attained'

Step 4: If MARK >= 80 Then GRADE ← 'Distinction'

Step 5: Output GRADE

(i) What is the value of GRADE for each of the following values of MARK?

(1) MARK = 40 GRADE = Attained ✓

(2) MARK = 200 GRADE = Distinction ✓

(2)

(ii) Ada modifies the pseudocode by applying iteration control structure in Step 1 so that the value of MARK is between 0 and 100 inclusive as shown below.

Step 1: Repeat the input of values into MARK when the value of MARK is smaller than 0 or larger than 100

(1) Other than 0 and 100, give another test datum that can be used to identify the boundary cases of the algorithm.

Repeat the input of values into MARK ✗ when the value of MARK is equal to x.

(2) Which type of iteration control structure, pre-test, post-test or for loop, is used by Ada?

Pre-test. ✓

(1)

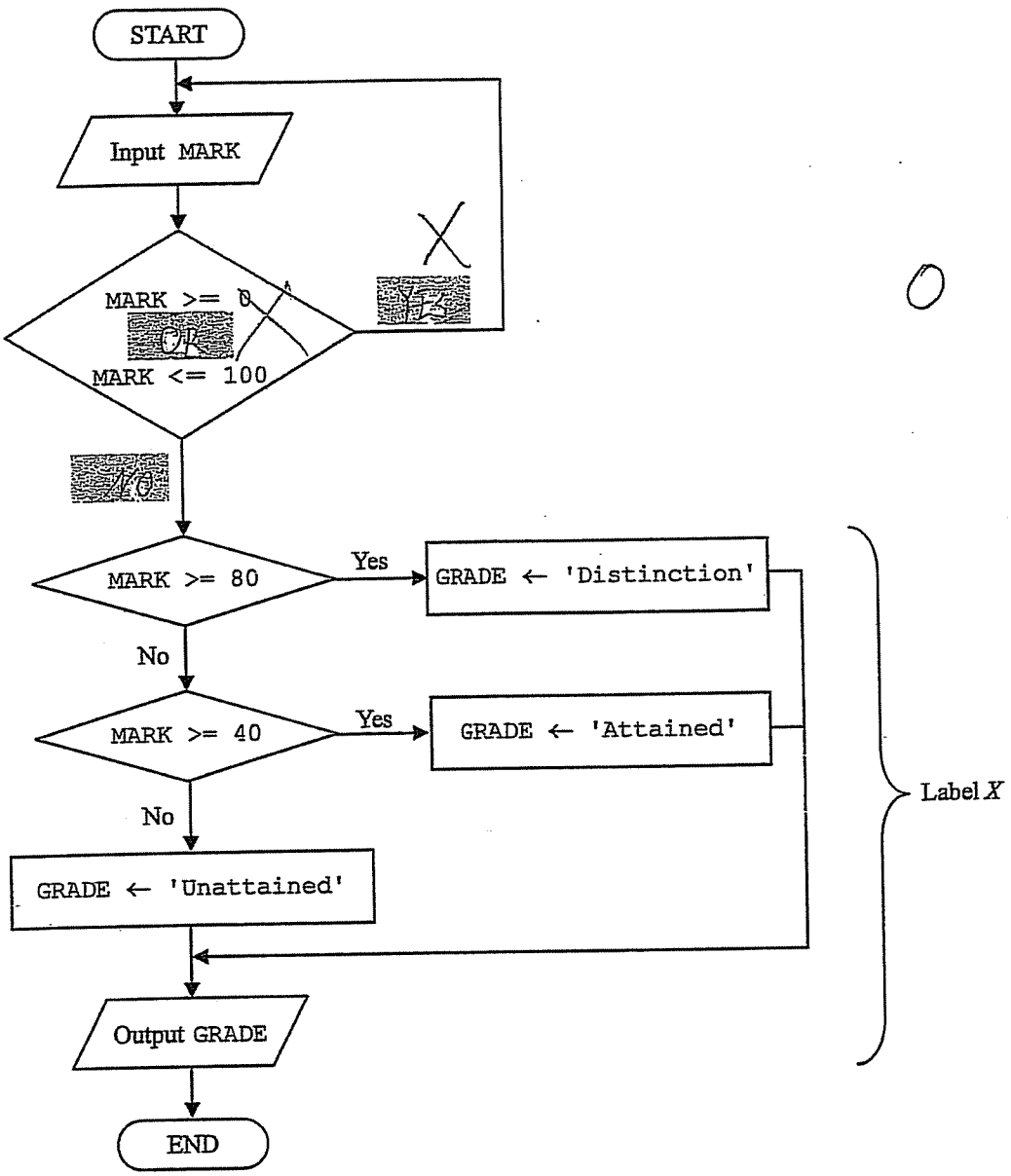
(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) Ben uses the following flowchart to represent his algorithm. Write down YES, NO and an appropriate operator in the shaded areas for the first decision box.



(2 marks)

(c) Compare the algorithm indicated by Label *X* with Ada's algorithm. Which one is more efficient? Explain briefly.

Ada's algorithm is more effigent. It is because Ada's is more simple, just has two conditions.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(d) A workstation in the system provides a virtual keyboard on the screen which can be used to enter marks.

(i) Give one advantage and one disadvantage of this design.

Advantage: efficient to enter the datas. 0

Disadvantage: when enter the marks, other people will saw it.

(ii) Suggest a common way to connect a keyboard to the workstation other than using a USB port.

Use the mobile phone. 0

(iii) Mr Law wants to connect a USB printer to the workstation but the connection fails. What is the potential software problem?

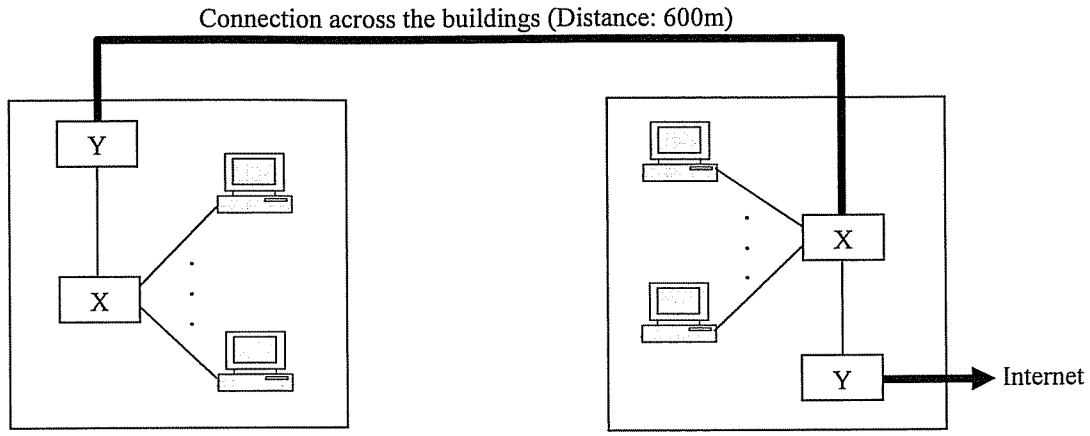
Run-time error. 0

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. Mr Li is the IT manager of a university in Australia. On the campus there are two computer networks in Building A and Building B which are used by staff and students respectively. The two buildings are apart, as shown below.



(a) (i) What network connecting devices are X and Y?

X: switch ✓ Y: modem ✗ (1)

(ii) Suggest a suitable type of network cable for the connection across the buildings and justify your answer.

Optical fibre ✗ because it can connect stable.

(iii) Instead of using a wired connection, Mr Li wants to connect two networks by installing microwave dishes on the roofs of the buildings. State two disadvantages of this approach.

It will easily affect by other things. such as light, water in air etc. Also the microwave is unstable it can not easily to cross the wall (1)

(5 marks)

(b) Mr Li subscribes to an Internet connection. A cable modem is needed to connect the campus network to the Internet. What is the function of the cable modem?

Cable modem Connect the network to Internet access via cable TV lines. ✗

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) Mr Li sets up an email server in the university and offers an email account to each student. In ea following cases, which email protocol for accessing email boxes is preferable? Justify your answe

(i) Each email box only has 5 MB storage space.

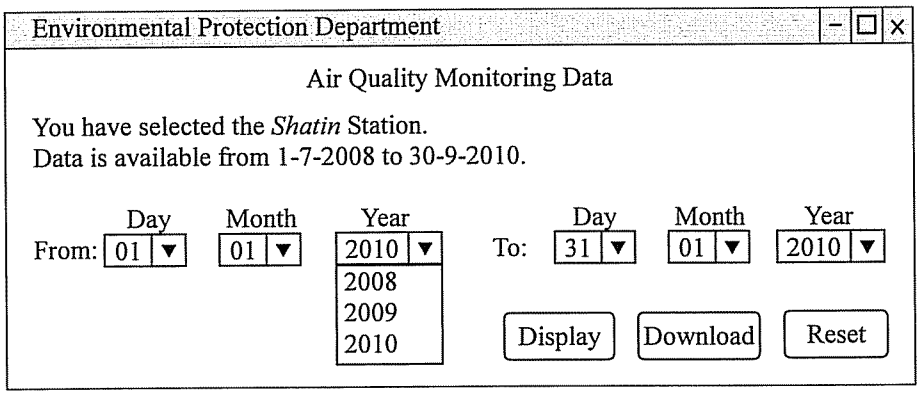
SMAP is perferable because the email box has a ~~low~~ small storage space that email are downloaded and stored in the computer.

(ii) Students can access their email boxes through any computer with Internet access.

Entire e-mail server is ~~not~~ possible since the student can check e-mails in anytime, anywhere. No limitations on the computers used.

(4 marks)

5. Peter wants to study the air quality in Shatin and Kwun Tong. He downloads the air quality monitoring data from the website of the Environmental Protection Department, as shown below:



(a) (i) In the web page above, how can the use of drop-down lists help with data input?

It prevents user from typing error when no drop-down list is provided, It make sures the data entry is valid. (1)

(ii) There should be two validation rules for checking the input data. Give two different sets of **invalid** data to illustrate the need for the rules.

		Day	Month	Year		Day	Month	Year
Set 1	From:	05	03	2008	To:	06	04	2009
Set 2	From:	07	08	2009	To:	02	06	2010

(1) ✓ (1) ✗

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

The readings of air pollutants, P1, P2 and P3, are collected every 6 hours. Peter downloads the data c
at Shatin and Kwun Tong in January 2010 and stores them in two worksheets of a spreadsheet file, S
and *Sheet2*, respectively. *Sheet1* is shown below.

	A	B	C	D	E	F	G
1			Time				
2	**Date**	**Pollutant**	**00 00**	**06 00**	**12 00**	**18 00**	**Average**
3	1-1-2010	P1	14	12	11	9	
4	1-1-2010	P2	116	103	102	78	
5	1-1-2010	P3	28	20	21	29	
6	2-1-2010	P1	25	18	18	26	
7	2-1-2010	P2	87	90	86	63	
8	2-1-2010	P3	10	9	9	2	
9	3-1-2010	P1	86	83	83	7	
⋮	⋮	⋮	⋮	⋮	⋮	⋮	
94	31-1-2010	P2	37	15	7	82	
95	31-1-2010	P3	4	6	12	3	
96							
97						P1 average:	

(b) Peter wants to find the average reading of P1 at Shatin in January 2010.

(i) To find the daily average readings of the pollutants everyday, a formula is entered into `G3` and is then copied into `G4` to `G95`. Write the formula in `G3`.

F3 = sum (C3 : F3) / F2 ✗ (1)

(ii) Write the formula in `G97` to find the average reading of P1 at Shatin in January 2010.

=(SUM(CHOOSE(B3:B95,"=P1"))/(COUNT(B3:B95,"=P1"))

(4 marks)

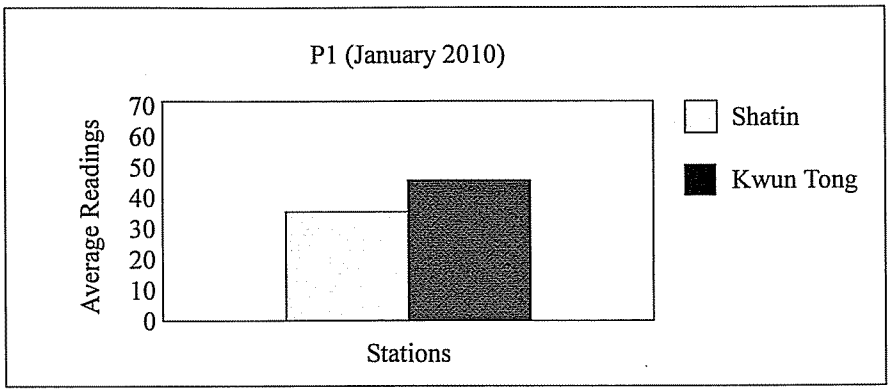
Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) The same steps in (b) have also been applied to *Sheet2* for the data collected at Kwun Tong.

Peter creates the following chart to show the average readings of P1 at Shatin and at Kwun Tong in January 2010.



(i) Describe, with major steps, how to create the chart.

Input data in a spreadsheet. Select all data you need, right click the mouse to select create charts, select bar chart. Or you can select all data you need and choose bar chart from the top of the tools bar.

2

(ii) Peter copies the chart into his presentation file. Afterwards he updates some readings of P1 on *Sheet1*. Will the chart in the presentation file change accordingly? Explain briefly.

No, because Peter just copies the image of picture. So when the numbers are change the chart can not change either. X

(5 marks)

END OF PAPER

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

本試卷全部試題均須回答。

1. 黃先生負責爲一家超級市場建立庫存系統。他建立了 INVENTORY 數據庫表格來儲存產品銷售的資料。以下是 INVENTORY 的部分內容：

INVENTORY

CAT (類別)	CODE (產品代碼)	NAME (產品名稱)	PRICE (產品價格)	QTY (庫存中的數量)
飲料	B163	BEST juice	10.0	10
零食	S968	좋은감자칩	12.2	40
麵條	N042	乐乐浓汤鸡面	20.2	20
飲料	B482	FRESH tea	25.9	80
麵條	N091	QQ noodle	8.4	50

(a) 哪個欄位 CAT、CODE、NAME、PRICE 或 QTY 應作爲關鍵欄位？ CODE (1 分)

(b) QTY 的數據類型是整數，黃先生的同事小麗建議將此數據類型更改爲實數或字串。黃先生不同意小麗的建議，爲什麼？

因為有機會出現英文式小數

(2 分)

(c) 哪一個字符編碼系統是最適合儲存 NAME 的數據？試簡單解釋。

字串，因為字串能記下NAME。

(2 分)

(d) (i) 黃先生寫了下列 SQL 指令。根據上述 INVENTORY 內五個已知的記錄，執行此查詢後的結果是什麼？

```
Select CODE, PRICE from INVENTORY where PRICE > 10 and QTY < 40
```

CODE	PRICE
N042	20.2

(ii) 現已將 INVENTORY 匯入到一個試算表內。試以步驟描述如何使用試算表軟件內的功能，提取與 (d)(i) 查詢後一樣的結果。

CODE, ~~NAME~~ PRICE (PRICE>10, QTY<40)

(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

請在此貼上電腦條碼

(e) 黃先生考慮以無線射頻識別 (RFID) 系統取代現有條碼系統，以便收集產品資料。試舉出使用 RFID 系統而非條碼系統的一個優點和一個缺點。

優點：能使不限空地方限發，隨時使用。

缺點：無線較有線的連線不穩定。

(2 分)

2. 佩珊因工作需要而購買了一部平板電腦。該電腦的規格如下：

中央處理器	1.2 GHz 雙核心處理器
顯示器	8 吋 LED 觸控屏幕
記憶體及儲存	512 MB (ROM)，64 GB 快閃記憶體
輸入／輸出	USB 2.0，內置揚聲器
連接	Wi-Fi，藍芽
電池（續航時間）	14 小時
重量	0.5 千克
尺寸	190×130×10 毫米

(a) 試列舉這部平板電腦**兩個**專爲提高其流動性的特點。

可以使用續航的電池。設有無線連接 (Wi-Fi 藍芽)。

(2 分)

(b) (i) 這部平板電腦設有 64 GB 的快閃記憶體，與普通手提電腦的配置非常不同。爲什麼？

需要隨時暫存容量大的檔案。

(ii) 應否以 SDRAM 來取代這部平板電腦內的快閃記憶體？試簡單解釋。

應該，因爲 CPU 運算時需花時間讀取快閃記憶體。(關機時)

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) 在平板電腦內 ROM 儲存的程式中，哪一個是最重要的？

程式 ✗ 0

(1 分)

佩珊發現她在公司內的桌面電腦感染了電腦病毒。

(d) (i) 試列出**兩種**可以通過互聯網傳播電腦病毒至其他電腦的可能途徑。

利用集線器傳播電腦病毒。利用電郵把電腦病毒傳出。✓ (1)

(ii) 有時最先進的防病毒軟件也無法刪除一些電腦病毒。試簡單解釋這種情況。

因為防毒軟件沒有設定刪除電腦的程式。✗ 0

(3 分)

佩珊建議公司技術人員李先生，可在辦公室的電腦內安裝有 30 天試用期的照片編輯共享軟件。

(e) (i) 在安裝軟件前，李先生應了解哪個與版權有關的問題？他需閱讀哪份文件？

照片的版權問題。他需閱讀如何合法地獲取版權。✗ 0

(ii) 佩珊下載並安裝一個盜版照片編輯軟件在她的電腦內。她這樣做可會帶來什麼法律後果？

侵犯版權 ✗ 0

(3 分)

(f) 李先生在所有電腦內安裝一個軟件，使每台電腦在每次重新啟動後自動恢復到原來的狀態。試列出這個軟件的一個優點和一個缺點。

優點：可以使電腦保持無電腦病毒。✓

缺點：儲存電腦的檔案會遺失 ✓ (2)

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

請在此貼上電腦條

3. 小翠及智仁協助羅先生設計一個電腦系統，用以尋找輸入分數之對應等級。

(a) 小翠使用以下偽代碼來展示她的算法：

Mark A

步驟 1：輸入一個數值，並儲存在 MARK 內
步驟 2：若 MARK < 40 則 GRADE ← 'Unattained'
步驟 3：若 MARK >= 40 則 GRADE ← 'Attained'
步驟 4：若 MARK >= 80 則 GRADE ← 'Distinction'
步驟 5：輸出 GRADE

(i) 試就以下每個 MARK 的數值，寫出 GRADE 內的值。 (1)

(1) MARK = 40 GRADE = 'Attained' ✓

(2) MARK = 200 GRADE = 'Attained' / 'Distinction'

(ii) 小翠採用迭代控制結構來修改步驟 1 之偽代碼，使 MARK 值介乎 0 和 100 之間，包括首尾兩數，如下所示。

步驟 1：當 MARK 值小於 0 或大於 100，重複輸入數值至 MARK 內。

(1) 除了 0 和 100，試寫出另一個可以用來識別算法的邊際個案的測試數據。

字位未檢查。

(2) 小翠使用了前期測試、後期測試，抑或 for 循環類型的迭代控制結構呢？

前置日測邊試 (1)

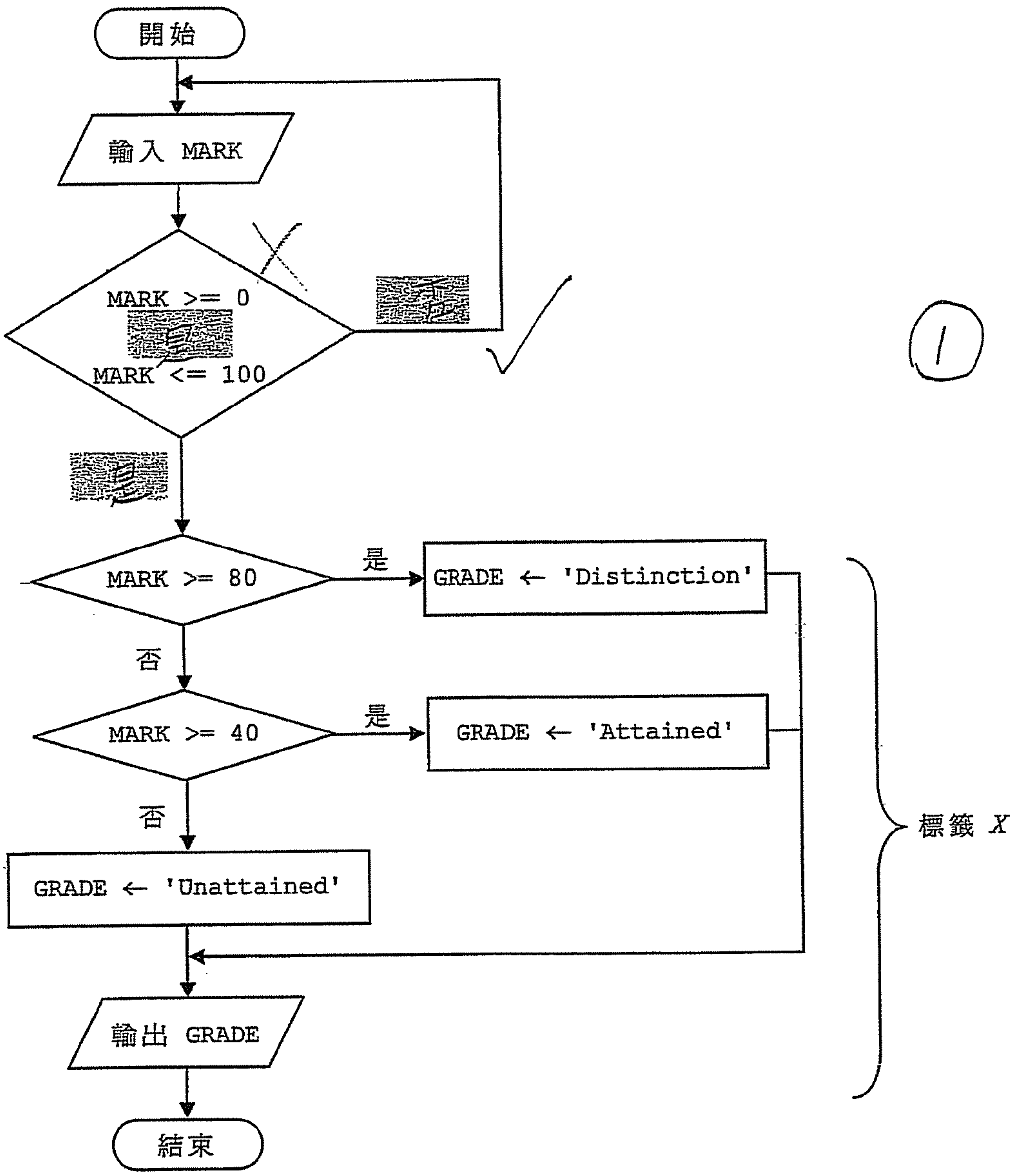
(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(b) 智仁使用下列流程圖來展示他的算法。在第一個判定框之陰影區內，填寫「是」、「否」及適合之運算符。



(2 分)

(c) 比較標籤 *X* 範圍內的算法與小翠的算法，哪一個更爲有效率？試簡略說明。

標籤X 因為可以杜絕沒有雙重輸出的情況。小翠的算法在 MARK>=80 時 MARK<=100 會出現雙重輸出。

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(d) 此系統的工作站提供虛擬鍵盤，讓用戶在屏幕上輸入分數。

(i) 試列出這項設計的一個優點及一個缺點。

優點： 要輸入錯誤的分數

缺點： 輸入耗時較多。

(ii) 除使用 USB 埠外，試建議另一個連接鍵盤到工作站的常見方案。

使用虛擬鍵盤。

(iii) 羅先生打算連接一部 USB 打印機至工作站，但連線失敗。試舉出一個潛在的軟件問題。

打印機沒有設定工作的軟件。

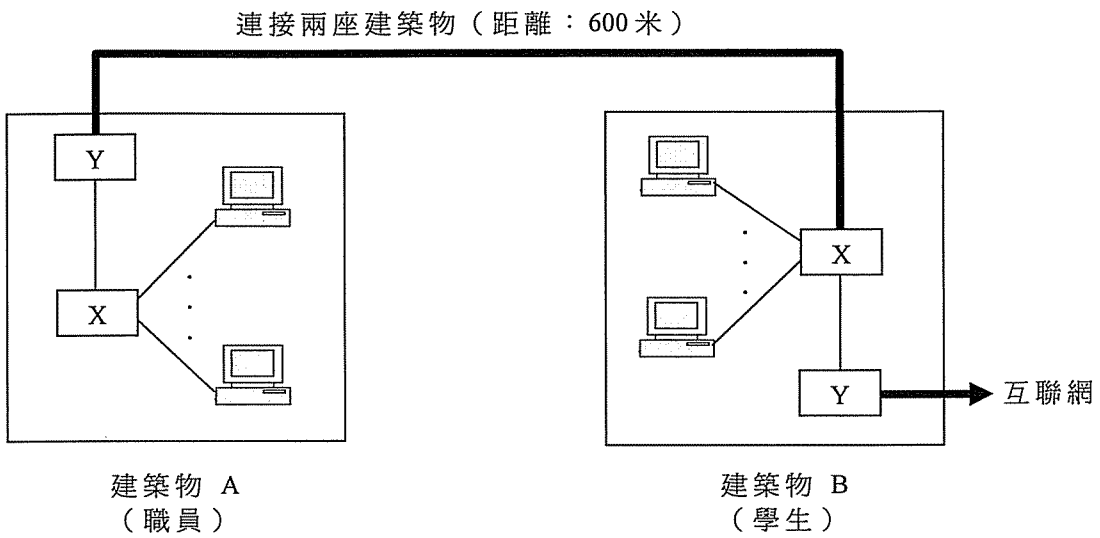
(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

4. 李先生是澳洲一間大學的 IT 經理。在校園裏有兩個電腦網絡，位於建築物內，分別供職員及學生使用。兩座建築物相距 600 米，如下圖所示。



(a) (i) X 和 Y 是什麼網絡連接裝置？

X: 交換器 ✓ (1)　Y: 路由器 ✓ (1)

(ii) 試建議適合的網絡電纜類別來連接兩座建築物，並加以說明。

光纖，因為兩座建築物相距遠，使用光纖能增加傳輸速度。✓ (1)

(iii) 李先生不欲使用有線連接，希望在建築物頂層安裝微波碟形天線來連接這兩個電腦網絡。試舉出這種做法的**兩個**缺點。

遭到他人破壞和接收範圍太大，其他網絡都也能使用相同的連線。✗

(5 分)

(b) 李先生選用了互聯網連接服務，並需要使用電纜數據機來連接校園網絡至互聯網。此電纜數據機的功用是什麼？

轉換电脑讯号至模拟信号 ✗ (1)

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) 李先生在大學內建立一個電子郵件伺服器，並向每名學生提供一個電子郵
戶。在下列每種情況下，哪一種電郵協定較適合用於接達電子郵件信箱？請
以說明。

(i) 每個電子郵件信箱只有 5 MB 的儲存空間。

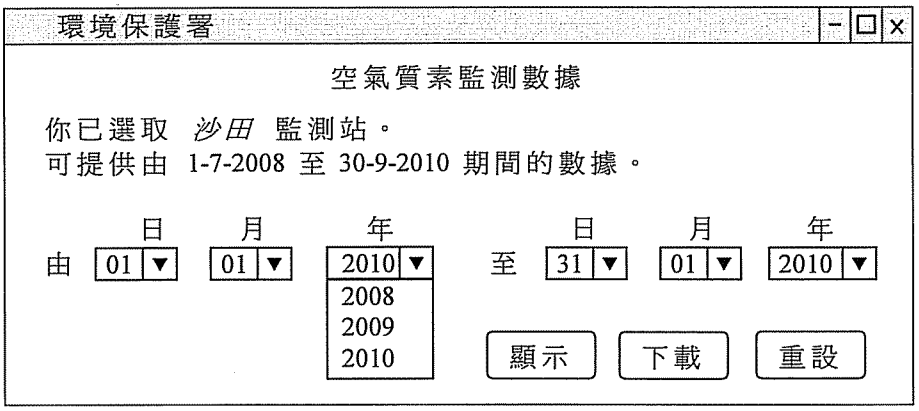
POP3 X(1)

(ii) 學生可使用任何已連接互聯網之電腦來接達他們的電子郵件信箱。

學用戶電郵協定，因為學生可以利用不同連上互聯網的電腦來接達電子郵件信箱，不用規限於學校使用。

(4 分)

5. 智偉打算研究在沙田及觀塘的空氣質素。他從環境保護署網站下載了空氣質素監測數據，如下所示：



(a) (i) 在以上網頁裏，下拉式清單如何協助數據輸入？

規定了用戶必須選取所提供的選項。

(ii) 這裏應有兩個有效檢驗規則用來檢查輸入的數據。試列出兩組不同的**無效**數據來說明此需要。

第一組

	日	月	年		日	月	年
由：	38	30	2008	至：	70	80	2009

第二組

	日	月	年		日	月	年
由：	010	08	2019	至：	05	08	2013

(3 分)

每隔 6 小時空氣污染物 P1、P2 和 P3 的讀數會被收集起來。智偉下載了沙田及[illegible]在 2010 年 1 月的數據，並將它們分別儲存在兩個工作表 *Sheet1* 和 *Sheet2* 的試算的文件內。下列展示 *Sheet1* 的工作表。

	A	B	C	D	E	F	G
1			時間				
2	**日期**	**污染物**	**00 00**	**06 00**	**12 00**	**18 00**	**平均讀數**
3	1-1-2010	P1	14	12	11	9	
4	1-1-2010	P2	116	103	102	78	
5	1-1-2010	P3	28	20	21	29	
6	2-1-2010	P1	25	18	18	26	
7	2-1-2010	P2	87	90	86	63	
8	2-1-2010	P3	10	9	9	2	
9	3-1-2010	P1	86	83	83	7	
⋮	⋮	⋮	⋮	⋮	⋮	⋮	
94	31-1-2010	P2	37	15	7	82	
95	31-1-2010	P3	4	6	12	3	
96							
97						P1 平均讀數：	

(b) 智偉打算找出 2010 年 1 月沙田的 P1 平均讀數。

(i) 在 G3 輸入一條公式，並複製到 G4 至 G95，這樣便可找出各種污染物的每日平均讀數。試寫出 G3 的公式。

=(C3+D3+E3+F3)/4 ✓(1)

(ii) 試寫出 G97 的公式，以便找出 2010 年 1 月沙田的 P1 平均讀數。

=average(if $B3=P1, G3:G95) ✗

(4 分)

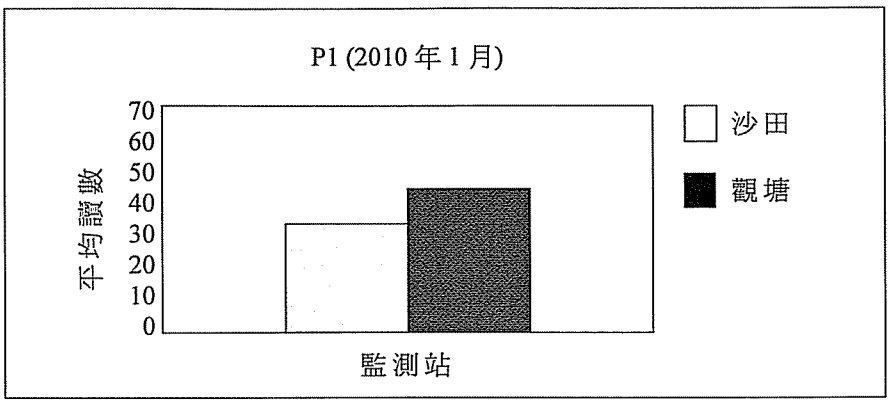
寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) *Sheet2* 工作表也採用與 (b) 部相同的步驟，處理了在觀塘所收集的數據。

智偉建立以下圖表，展示在 2010 年 1 月分別於沙田及觀塘的 P1 平均讀數。



(i) 試以主要步驟描述如何建立此圖表。

首先把 Sheet1 和 Sheet2 中 P1 平均讀數的資料複製
於一个新的試算表內。
然後按圖表精靈並選取棒形圖類型。

(ii) 智偉複製此圖表至他的演示文件內。後來他在 *Sheet1* 中更新某些 P1 的讀數。這個演示文件中的圖表會否有相應的變化？試簡略解釋。

會。因為 Sheet 1 中沙田的讀數有些改變，而
這些亦何 P1 的讀數與 P1 平均讀數都有關連。如
P1 的讀數改變，P1 平均讀數也會改變，而此
圖表是根據 Sheet 1 及 Sheet 2 P1 平均讀數而建立的，
因此圖表也會有相應的變化。 (5 分)

試卷完

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

ICT 2A

Answer all questions.

1. An examination agent designs the following database tables to store the information on candidates who register for examination.

CAND

Field name	Type	Width	Description
CNUM	Character	8	Unique candidate number of the candidate where the first three characters are the unique school code of the candidate's school
CNAME	Character	30	Name of the candidate
DOB	Date		Date of birth of the candidate

REGISTER

Field name	Type	Width	Description
CNUM	Character	8	Candidate number of the candidate who sits the examination of the subject
SCODE	Character	2	Unique subject code

SUBJECT

Field name	Type	Width	Description
SCODE	Character	2	Unique subject code
SNAME	Character	30	Name of the subject

(a) (i) Write a SQL command to create CAND.

```
CREATE TABLE CAND
(CNUM CHAR(8) UNIQUE, CNAME CHAR(30), DOB DATE)
```

2

(ii) Which of the following can be a candidate key of CAND? Explain briefly.

(1) CNUM (2) CNAME + DOB

(1) can be the candidate key of CAND because every candidate has a unique candidate number while there may be more than one candidates having the same name and date of birth so (2) cannot.

2

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(iii) Write a SQL command to create an index file, CIND, for CAND on CNUM. What is the advantage of using this index file?

SQL command: CREATE INDEX CIND ON CAND (CNUM) 2

Advantage: It speeds up the process of sorting and filtering the data stored in the field CNUM 1

(7 marks)

(b) Identify the primary key(s) and foreign key(s) of REGISTER.

Primary key: CNUM, SCODE 1

Foreign key: CNUM, SCODE 2

(3 marks)

(c) (i) Write a SQL command to increase the width of CNUM in CAND to 12. Make sure that CNUM would never be empty.

```
ALTER TABLE CAND
ALTER COLUMN CNUM CHAR(12) NOT NULL
```

2

(ii) Write a SQL command to list all the candidate names and their corresponding school codes.

```
SELECT CNAME, LEFT(CNUM, 3)
FROM CAND
```

2

(iii) The subject code and subject name of a new subject are 09 and LAW respectively. Write a SQL command to insert this record into SUBJECT.

```
INSERT INTO SUBJECT VALUES
('09', 'LAW')
```

2

(6 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2. A database table, CLINIC, stores the information on patients who visit a clinic for treatment. The design of CLINIC is based on the following assumptions:

- There may be some illnesses that no patient ever visits for.
- A doctor can prescribe medicine by zero or more injections for an illness and prescribe medicine by one injection for a number of illnesses.

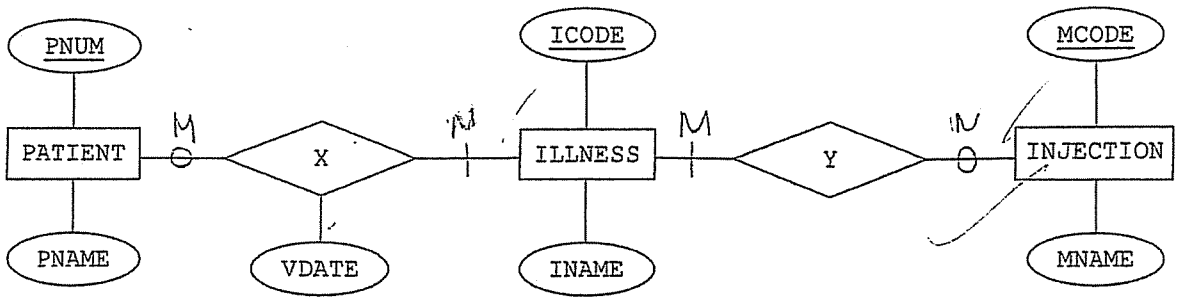
The fields in CLINIC are shown below:

Field name	Description
PNUM	Unique patient number
PNAME	Name of patient
VDATE	Date of the clinic visit
ICODE	Unique illness code
INAME	Name of illness
MCODE	Unique injection code
MNAME	Name of the injection

(a) Explain briefly how the design of CLINIC leads to data redundancy.

As both the patient number and name of patient, illness code and name of illness, injection code and name of injection refer to the same patient, illness and injection respectively. Storing the unnecessary data in the extra fields leads to data redundancy (2 marks)

The incomplete E-R diagram below represents an alternative design for the clinic to fulfill the assumptions.



3

(b) (i) Give the appropriate words for the relationships in X and Y.

X: visits for Y: requires

2

(ii) Complete the E-R diagram above.

(5 marks)

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(c) Transform the E-R diagram into the database schemas below.

X(VDATE, PNUM, ICODE)

Y(ICODE, MCODE)

2

2

(4 marks)

(d) Can the alternative design handle an illness without the need for an injection? Explain briefly.

Yes, it is because the records of all illnesses are stored in the table ILLNESS

~~will value in a record with the ICODE of the special illness.~~

2

(2 marks)

(e) One day, one type of medicine is prohibited by the government.

(i) Give one problem which will occur when the record of the prohibited medicine is removed from INJECTION in the alternative design.

The records in table Y with the MCODE equals to the injection code of the prohibited medicine are not deleted.

(ii) Suggest a method of handling prohibited medicines in the alternative design.

Delete the records in table Y with the MCODE equals to the injection code of the prohibited medicine

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. A web site uses the following database tables to store information on restaurants.

RES

Field name	Type	Width	Description	Example of data
RESID	Character	5	Identification code of the restaurant	02173
RESNAME	Character	30	Name of the restaurant	EAA Cafe mini
RATING	Numeric	1	Rating of the restaurant	3
DISTRICT	Character	2	District code of the restaurant	04
CUISINE	Character	2	Cuisine code of the restaurant	07
SPENDING	Numeric	3	Spending per person	80

DIST

Field name	Type	Width	Description	Example of data
DISTRICT	Character	2	District code	04
DISTNAME	Character	30	Name of the district	Wanchai

CUI

Field name	Type	Width	Description	Example of data
CUISINE	Character	2	Cuisine code	07
CUINAME	Character	30	Type of cuisine	Italian

Write SQL commands to complete the tasks in (a) to (e).

(a) List the names and ratings of restaurants with a rating equal to or greater than 3, in descending order of the rating.

```
SELECT RESNAME, RATING FROM RES
WHERE RATING >= 3
ORDER BY RATING DESC
```

(3 marks) 3

(b) Calculate the average spending per person of those restaurants with 'Cafe' in their names.

```
SELECT AVG(SPENDING)
FROM RES
WHERE RESNAME LIKE '%Cafe%'
```

(2 marks) 2

(c) List the names of restaurants in the district 'Mongkok'.

```
SELECT RESNAME
FROM RES AS R, DIST AS D
WHERE R.DISTRICT = D.DISTRICT
AND DISTNAME = 'Mongkok'
```

(2 marks) 2

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(d) List the number of restaurants offering Thai cuisine (i.e. `CUINAME = 'Thai'`) in each district.

```
SELECT  DISTNAME, COUNT(*)
FROM RES AS R, DIST AS D, CUI AS C
WHERE R.DISTRICT = D.DISTRICT
AND R.CUISINE = C.CUISINE
AND CUINAME = 'Thai'
GROUP BY DISTNAME
```

4

(4 marks)

(e) List the district name which has the largest number of restaurants with a rating greater than 3.

```
SELECT R.DISTRICT AS DISTID, COUNT(*) AS NUM INTO REST
FROM RES AS R, DIST AS D
WHERE R.DISTRICT = D.DISTRICT
AND RATING > 3
GROUP BY R.DISTRICT
SELECT DISTNAME
FROM REST AS A, DIST AS B
WHERE A.DISTID = B.DISTRICT
AND NUM =
    (SELECT MAX (NUM) FROM REST)
```

4

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. A catering service company provides lunches to primary school students. Before the beginning of each month, students fill in a form, as below:

Meal Order Form							
Year/Month: 20 /							
Student name:					HKID number:		
Class:					Class number:		
Fill in meal type (A, B or C) for each day							
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐
9 ☐	10 ☐	11 ☐	12 ☐	13 ☐	14 ☐	15 ☐	16 ☐
17 ☐	18 ☐	19 ☐	20 ☐	21 ☐	22 ☐	23 ☐	24 ☐
25 ☐	26 ☐	27 ☐	28 ☐	29 ☐	30 ☐	31 ☐	
Meal sub-total (Number of meals ordered x $18):							
Meal with juice: Yes / No If yes, add $150.							
TOTAL:							
Payment method (Blacken the square)							
☐ Convenience shop ☐ Cheque ☐ Phone payment Transaction / Cheque / Payment number: _____							

(a) The following is *part* of a data dictionary that represents the meal order form for one of the schools.

Field name	Data type	Width	Description
SCHNAME	Character	50	School name
STNAME	Character	50	Student name
HKIDNO	Character	11	Student's HKID number
CLASS	Character	2	Class
CLASSNO			Class number
JUICE			Meal with juice (Yes / No)
TOTAL	Real		Total amount
PAYMETHOD	Character	1	Payment method: C: convenience shop Q: cheque P: phone payment
PAYMENTNO	Character	10	Transaction / Cheque / Payment number

(i) TOTAL seems to be unnecessary in the data dictionary. Why?

It is because it can be calculated from the data stored in the table. 1

(ii) Other than Character, suggest suitable data types for x and y.

x: Integer y: logical 2

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Answers written in the margins will not be marked.

(iii) Illustrate the domain integrity in the above design.

Domain integrity is maintained by using the key field HKIDNO because all data stored in this field are not null and are unique.

(5 marks)

(b) Parents complain about the need to provide HKID numbers and student names. What should the following people do in order to prevent this kind of complaint?

Database designer: Delete the fields HKIDNO and STNAME from the table and use a combination of SCHNAME, CLASS and CLASSNO as the key field

Data entry operator: Stop requiring parents to provide HKID numbers and names of the students

(2 marks)

(c) The company serves many schools and wants to store all meal orders. It designs a Third Normal Form (3NF) database table, MEALPLAN3, with the following field names.

Field name	Description
STNO	Unique student number
MEALDATE	Date for the meal
MEALTYPE	Meal type

(i) Explain why MEALPLAN3 is in 3NF.

It is because all the fields in MEALPLAN3 do not contain data with multi-values. Besides, partial dependency does not occur as the only non-key attribute (MEALTYPE) completely depends on all the key fields (STNO and MEALDATE). Also, transitive dependency does not occur as there is no any non-key attribute depending on another non-key attribute.

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Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(ii) The company defines the database table

`MEALPLAN1 (STNO, Y, M, MEALTYPE01, MEALTYPE02, ... , MEALTYPE31)`

where the 31 fields, `MEALTYPE01, MEALTYPE02, ... , MEALTYPE31`, store the meal types for the days of the month `M` and year `Y`.

Is `MEALPLAN3` better than `MEALPLAN1`? Explain briefly.

Yes, it is because there may be null values in the 31 fields if the students do not order meals on all days in a month or the month does not have 31 days in the table MEALPLAN1.

(5 marks) 1

(d) The records of all meal orders will be analysed using data mining. Suggest an example of data to be mined and explain how it can be used by the company to improve its service.

The commonest meal type that the students in each school prefer can be mined so the company can provide a wider variety of the meals of the most favoured meal type to students in each school to improve its service.

(2 marks) 2

END OF PAPER

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answer all questions.

1. An examination agent designs the following database tables to store the information on candidates who register for examination.

CAND

Field name	Type	Width	Description
CNUM	Character	8	Unique candidate number of the candidate where the first three characters are the unique school code of the candidate's school
CNAME	Character	30	Name of the candidate
DOB	Date		Date of birth of the candidate

REGISTER

Field name	Type	Width	Description
CNUM	Character	8	Candidate number of the candidate who sits the examination of the subject
SCODE	Character	2	Unique subject code

SUBJECT

Field name	Type	Width	Description
SCODE	Character	2	Unique subject code
SNAME	Character	30	Name of the subject

(a) (i) Write a SQL command to create CAND.

```
Create table CAND
    CNUM CHAR(8),
    CNAME CHAR(30),
    DOB DATE
```

(ii) Which of the following can be a candidate key of CAND? Explain briefly.

(1) CNUM (2) CNAME + DOB

CNUM can be the key. CNUM is unique in CAND. But CNAME + DOB may not be unique as names plus d.o.b is not unique.

2

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(iii) Write a SQL command to create an index file, CIND, for CAND on CNUM. What is the advantage of using this index file?

SQL command: Create index CIND on CAND(CNUM) ✓ 2

Advantage: The speed of sorting the table ~~and~~ ⇒ can be increased. ✓ 1

(7 marks)

(b) Identify the primary key(s) and foreign key(s) of REGISTER.

Primary key: CNUM + SCODE ✓ 1

Foreign key: CNUM, SCODE ✓ 2

(3 marks)

(c) (i) Write a SQL command to increase the width of CNUM in CAND to 12. Make sure that CNUM would never be empty.

```
Alter table ~~CNUM~~ CAND
    Alter column CNUM CHAR(12)
```

✓ ✓ ✗ 1

(ii) Write a SQL command to list all the candidate names and their corresponding school codes.

```
Select CNAME, LEFT(CNUM,3) as 'School Codes' from CAND
```

✓ ✓ 2

(iii) The subject code and subject name of a new subject are 09 and LAW respectively. Write a SQL command to insert this record into SUBJECT.

```
Insert into SUBJECT
    Values ("09", "LAW")
```

✓ ✓ 2

(6 marks)

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Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2. A database table, CLINIC, stores the information on patients who visit a clinic for treatment. The design of CLINIC is based on the following assumptions:

- There may be some illnesses that no patient ever visits for.
- A doctor can prescribe medicine by zero or more injections for an illness and prescribe medicine by one injection for a number of illnesses.

The fields in CLINIC are shown below:

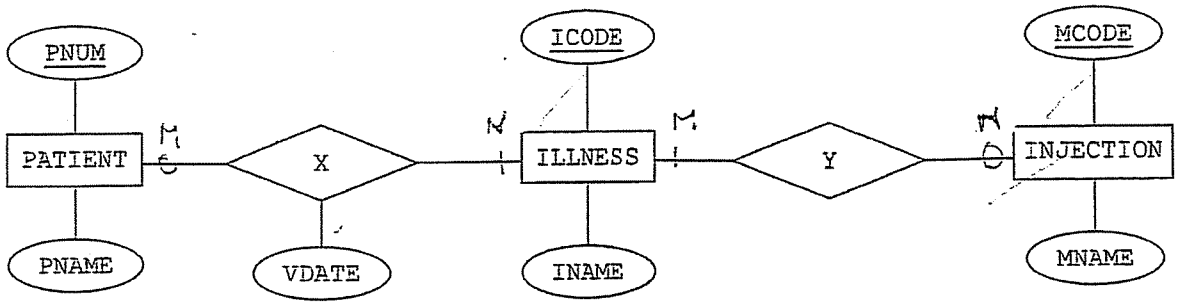
Field name	Description
PNUM	Unique patient number
PNAME	Name of patient
VDATE	Date of the clinic visit
ICODE	Unique illness code
INAME	Name of illness
MCODE	Unique injection code
MNAME	Name of the injection

(a) Explain briefly how the design of CLINIC leads to data redundancy.

INAME depends on ICODE while MNAME depends on MCODE. when patient is prescribed more than one illness or injection, the other information will be redundant in the record word. ✓ 2

(2 marks)

The incomplete E-R diagram below represents an alternative design for the clinic to fulfill the assumptions.



3

(b) (i) Give the appropriate words for the relationships in X and Y.

X: have ✓ Y: perform ✓ 2

(ii) Complete the E-R diagram above.

(5 marks)

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(c) Transform the E-R diagram into the database schemas below.

X(PNUM , ICODE , VDATE)

Y(ICODE , MCODE)

(4 marks)

(d) Can the alternative design handle an illness without the need for an injection? Explain briefly.

Yes. Illness without need for an injection will not be in Y. The alternative design don't cause blank field like ICODE in original design.

(2 marks)

(e) One day, one type of medicine is prohibited by the government.

(i) Give one problem which will occur when the record of the prohibited medicine is removed from INJECTION in the alternative design.

The patients who are injected with the medicine cannot find back the medicine name that they used before.

(ii) Suggest a method of handling prohibited medicines in the alternative design.

Add in a column on INJECTION called prohibited, a boolean to state whether the medicine is currently prohibited by the government.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. A web site uses the following database tables to store information on restaurants.

RES

Field name	Type	Width	Description	Example of data
RESID	Character	5	Identification code of the restaurant	02173
RESNAME	Character	30	Name of the restaurant	EAA Cafe mini
RATING	Numeric	1	Rating of the restaurant	3
DISTRICT	Character	2	District code of the restaurant	04
CUISINE	Character	2	Cuisine code of the restaurant	07
SPENDING	Numeric	3	Spending per person	80

DIST

Field name	Type	Width	Description	Example of data
DISTRICT	Character	2	District code	04
DISTNAME	Character	30	Name of the district	Wanchai

CUI

Field name	Type	Width	Description	Example of data
CUISINE	Character	2	Cuisine code	07
CUINAME	Character	30	Type of cuisine	Italian

Write SQL commands to complete the tasks in (a) to (e).

(a) List the names and ratings of restaurants with a rating equal to or greater than 3, in descending order of the rating.

```
Select RESNAME, RATING from RES where RATING >= 3 order by
RATING DESC
```

(3 marks) 3

(b) Calculate the average spending per person of those restaurants with 'Cafe' in their names.

```
Select (SUM(SPENDING)/COUNT(*)) AS 'Average spending' where
RESNAME LIKE '%CAFE%' GROUP BY (SUM(SPENDING)/COUNT(*))
```

(2 marks) 1

(c) List the names of restaurants in the district 'Mongkok'.

```
Select RESNAME from RES, DIST where RES.DISTRICT=DIST.DISTRICT and
DISTNAME = 'Mongkok'.
```

(2 marks) 2

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(d) List the number of restaurants offering Thai cuisine (i.e. CUINAME = 'Thai') in each district.

```
Select DISTNAME, COUNT(*) from RES, DIST, CUI where
RES.DISTRICT = DIST.DISTRICT and RES.CUISINE = CUI.CUISINE and
CUINAME = 'Thai'
Group by DISTNAME
```

(4 marks)

4

(e) List the district name which has the largest number of restaurants with a rating greater than 3.

```
Select DISTNAME, COUNT(*) from DIST, RES
where DIST.DISTRICT = RES.DISTRICT and RATING > 3
Group by DISTNAME
Having COUNT(*) = (Select MAX(COUNT(*)) from RES where
                   RATING > 3 Group by DISTRICT
```

(4 marks)

2

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. A catering service company provides lunches to primary school students. Before the beginning of each month, students fill in a form, as below:

Meal Order Form							
Year/Month: 20 /							
Student name:					HKID number:		
Class:					Class number:		
Fill in meal type (A, B or C) for each day							
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐
9 ☐	10 ☐	11 ☐	12 ☐	13 ☐	14 ☐	15 ☐	16 ☐
17 ☐	18 ☐	19 ☐	20 ☐	21 ☐	22 ☐	23 ☐	24 ☐
25 ☐	26 ☐	27 ☐	28 ☐	29 ☐	30 ☐	31 ☐	
Meal sub-total (Number of meals ordered x $18):							
Meal with juice: Yes / No If yes, add $150.							
TOTAL:							
Payment method (Blacken the square)							
☐ Convenience shop ☐ Cheque ☐ Phone payment Transaction / Cheque / Payment number: _____							

(a) The following is ***part*** of a data dictionary that represents the meal order form for one of the schools.

Field name	Data type	Width	Description
SCHNAME	Character	50	School name
STNAME	Character	50	Student name
HKIDNO	Character	11	Student's HKID number
CLASS	Character	2	Class
CLASSNO			Class number
JUICE			Meal with juice (Yes / No)
TOTAL	Real		Total amount
PAYMETHOD	Character	1	Payment method: C: convenience shop Q: cheque P: phone payment
PAYMENTNO	Character	10	Transaction / Cheque / Payment number

(i) TOTAL seems to be unnecessary in the data dictionary. Why?

Total is the total pay, which can be calculated by the information in other part of database

(ii) Other than Character, suggest suitable data types for *x* and *y*.

x: Character *y*: Boolean

Answers written in the margins will not be marked.

(iii) Illustrate the domain integrity in the above design.

TOTAL is unnecessary data and PAYMETHOD has transitive dependency (transitive) on PAYMENTNO.

(5 marks)

(b) Parents complain about the need to provide HKID numbers and student names. What should the following people do in order to prevent this kind of complaint?

Database designer: To place a unique client_id to all students so the instead of HKID. Client_id can be primary key. 1

Data entry operator: To assign a random client_id to all students currently in the table.

(2 marks)

(c) The company serves many schools and wants to store all meal orders. It designs a Third Normal Form (3NF) database table, MEALPLAN3, with the following field names.

Field name	Description
STNO	Unique student number
MEALDATE	Date for the meal
MEALTYPE	Meal type

(i) Explain why MEALPLAN3 is in 3NF.

There is no any partial or transitive dependency in the table. STNO is unique, MEALDATE and MEALTYPE are not unique. However, STNO + MEALDATE is the key of the table, the repeated values are not redundancy. MEALTYPE is not depend on any fields. So the table is in 3NF. 2

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(ii) The company defines the database table

MEALPLAN1(STNO, Y, M, MEALTYPE01, MEALTYPE02, ... , MEALTYPE31)

where the 31 fields, MEALTYPE01, MEALTYPE02, ... , MEALTYPE31, store the meal types for the days of the month M and year Y.

Is MEALPLAN3 better than MEALPLAN1? Explain briefly.

Yes. There are holidays that student may don't need ordered meals. MEALPLAN3 can avoid data redundancy while MEALPLAN1 will result in blank field, wasting spaces. MEALPLAN3 is convenient for operating query while it is trouble in MEALPLAN1. (5 marks)

2

(d) The records of all meal orders will be analysed using data mining. Suggest an example of data to be mined and explain how it can be used by the company to improve its service.

Data mining can give ~~crucial~~ conclusive information of data like charts. The ~~to~~ For example, if the company find less student ~~#~~ choose meal A, the company may need to change meal A better to further attract students to choose. (2 marks)

END OF PAPER

Answers written in the margins will not be marked.

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Answer all questions.

1. An examination agent designs the following database tables to store the information on candidates who register for examination.

CAND

Field name	Type	Width	Description
CNUM	Character	8	Unique candidate number of the candidate where the first three characters are the unique school code of the candidate's school
CNAME	Character	30	Name of the candidate
DOB	Date		Date of birth of the candidate

REGISTER

Field name	Type	Width	Description
CNUM	Character	8	Candidate number of the candidate who sits the examination of the subject
SCODE	Character	2	Unique subject code

SUBJECT

Field name	Type	Width	Description
SCODE	Character	2	Unique subject code
SNAME	Character	30	Name of the subject

(a) (i) Write a SQL command to create CAND.

Create table cand (Cnum char(8) , Cname char(30) , DOB date)

1

(ii) Which of the following can be a candidate key of CAND? Explain briefly.

(1) CNUM (2) CNAME + DOB

(1) because Cnum is an unique candidate number. It must not be repeated. So it can be a candidate key of CAND

2

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(iii) Write a SQL command to create an index file, CIND, for CAND on CNUM. What is the advantage of using this index file?

SQL command: Create index Cind from CAND on CNum 1

Advantage: It may easier to search dates while 1
using index.

(7 marks)

(b) Identify the primary key(s) and foreign key(s) of REGISTER.

Primary key: Scode

Foreign key: CNum 1

(3 marks)

(c) (i) Write a SQL command to increase the width of CNUM in CAND to 12. Make sure that CNUM would never be empty.

updates table cand alter column (CNUm char(12) not null)

(ii) Write a SQL command to list all the candidate names and their corresponding school codes.

Select Cname, Cnum from Cand 1

(iii) The subject code and subject name of a new subject are 09 and LAW respectively. Write a SQL command to insert this record into SUBJECT.

insert into Subject values ('09', 'LAW') 2

(6 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2. A database table, CLINIC, stores the information on patients who visit a clinic for treatment. The design of CLINIC is based on the following assumptions:

- There may be some illnesses that no patient ever visits for.
- A doctor can prescribe medicine by zero or more injections for an illness and prescribe medicine by one injection for a number of illnesses.

The fields in CLINIC are shown below:

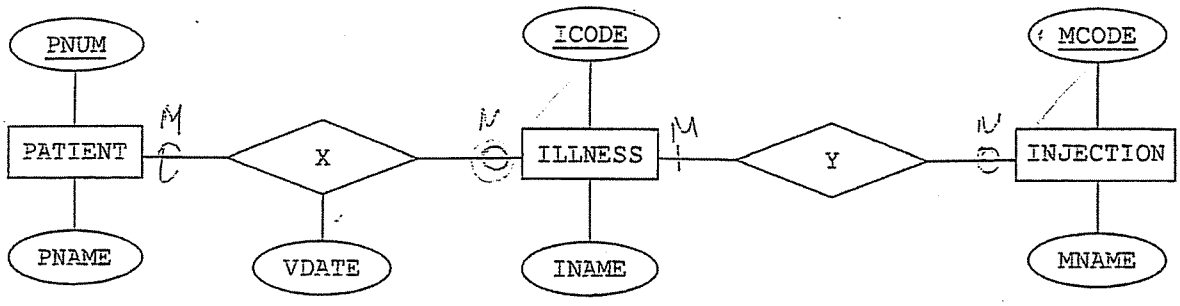
Field name	Description
PNUM	Unique patient number
PNAME	Name of patient
VDATE	Date of the clinic visit
ICODE	Unique illness code
INAME	Name of illness
MCODE	Unique injection code
MNAME	Name of the injection

(a) Explain briefly how the design of CLINIC leads to data redundancy.

Some of the data may repeat many times, for example if a patient always visits to clinic, then the database will always appear his name, etc that will make a data redundancy. 2

(2 marks)

The incomplete E-R diagram below represents an alternative design for the clinic to fulfill the assumptions.



2

(b) (i) Give the appropriate words for the relationships in X and Y.

X: suffer from Y: have 2

(ii) Complete the E-R diagram above.

(5 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

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(c) Transform the E-R diagram into the database schemas below.

X( )

Y( )

(4 marks)

(d) Can the alternative design handle an illness without the need for an injection? Explain briefly.

Yes, it sets to an option case, that means an illness may have many injection or may not have any injection.

(2 marks)

2

(e) One day, one type of medicine is prohibited by the government.

(i) Give one problem which will occur when the record of the prohibited medicine is removed from INJECTION in the alternative design.

The data which contains that kind of medicine will be emptyed.

(ii) Suggest a method of handling prohibited medicines in the alternative design.

select all the patients that who use this medicine and update the table that the medicine is prohibited.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. A web site uses the following database tables to store information on restaurants.

RES

Field name	Type	Width	Description	Example of data
RESID	Character	5	Identification code of the restaurant	02173
RESNAME	Character	30	Name of the restaurant	EAA Cafe mini
RATING	Numeric	1	Rating of the restaurant	3
DISTRICT	Character	2	District code of the restaurant	04
CUISINE	Character	2	Cuisine code of the restaurant	07
SPENDING	Numeric	3	Spending per person	80

DIST

Field name	Type	Width	Description	Example of data
DISTRICT	Character	2	District code	04
DISTNAME	Character	30	Name of the district	Wanchai

CUI

Field name	Type	Width	Description	Example of data
CUISINE	Character	2	Cuisine code	07
CUINAME	Character	30	Type of cuisine	Italian

Write SQL commands to complete the tasks in (a) to (e).

(a) List the names and ratings of restaurants with a rating equal to or greater than 3, in descending order of the rating.

```
select resname, rating from res
where rating >= 3
order by rating desc
```

(3 marks) 3

(b) Calculate the average spending per person of those restaurants with 'Cafe' in their names.

```
select avg(spending) from res
where resname like '%cafe%'
```

(2 marks) 2

(c) List the names of restaurants in the district 'Mongkok'.

```
Select resname from res as r, dist as d
where r.district = d.district and
district = 'Mongkok'
```

(2 marks) 2

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Answers written in the margins will not be marked.

Answers written in the margins will not be marked

(d) List the number of restaurants offering Thai cuisine (i.e. `CUINAME = 'Thai'`) in each district.

```
select district, count(*) from dist as d, cui as c
                  res as r
where r.cuisine = c.cuisine and r.district = d.district
and cuiname = 'Thai'
group by district
```

3

(4 marks)

(e) List the district name which has the largest number of restaurants with a rating greater than 3.

```
select max(rating) from res
where rating > 3

select distname, max(rating) from
res as r, dist as d
where r.district = d.district
and rating > 3 and
rating = max(rating) and
(select max(rating) from res)
```

1

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. A catering service company provides lunches to primary school students. Before the beginning of each month, students fill in a form, as below:

Meal Order Form							
Year/Month: 20 /							
Student name:					HKID number:		
Class:					Class number:		
Fill in meal type (A, B or C) for each day							
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐
9 ☐	10 ☐	11 ☐	12 ☐	13 ☐	14 ☐	15 ☐	16 ☐
17 ☐	18 ☐	19 ☐	20 ☐	21 ☐	22 ☐	23 ☐	24 ☐
25 ☐	26 ☐	27 ☐	28 ☐	29 ☐	30 ☐	31 ☐	
Meal sub-total (Number of meals ordered x $18):							
Meal with juice: Yes / No If yes, add $150.							
TOTAL:							
Payment method (Blacken the square)							
☐ Convenience shop ☐ Cheque ☐ Phone payment Transaction / Cheque / Payment number: _____							

(a) The following is ***part*** of a data dictionary that represents the meal order form for one of the schools.

Field name	Data type	Width	Description
SCHNAME	Character	50	School name
STNAME	Character	50	Student name
HKIDNO	Character	11	Student's HKID number
CLASS	Character	2	Class
CLASSNO	x		Class number
JUICE	y		Meal with juice (Yes / No)
TOTAL	Real		Total amount
PAYMETHOD	Character	1	Payment method: C: convenience shop Q: cheque P: phone payment
PAYMENTNO	Character	10	Transaction / Cheque / Payment number

(i) TOTAL seems to be unnecessary in the data dictionary. Why?

Because Total is followed by the field 'juice', so it is data redundancy in this case.

(ii) Other than Character, suggest suitable data types for x and y.

x: integer y: integer numeric

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(iii) Illustrate the domain integrity in the above design.

It ~~requests~~ requests the students HKID numbers, but during lunch may must not needed to give them the HKID number. It changes the privacy.

(5 marks)

(b) Parents complain about the need to provide HKID numbers and student names. What should the following people do in order to prevent this kind of complaint?

Database designer: & remove the field HKIDNO and add fields of school id and studentsid and make this two fields be the keyfields.

Data entry operator: He must enter school id and students id

(2 marks)

(c) The company serves many schools and wants to store all meal orders. It designs a Third Normal Form (3NF) database table, MEALPLAN3, with the following field names.

Field name	Description
STNO	Unique student number
MEALDATE	Date for the meal
MEALTYPE	Meal type

(i) Explain why MEALPLAN3 is in 3NF.

Because it does not have any transitive redundancy and ~~partial~~ the partial ~~redundancy~~ redundancy, so it is a 3NF.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(ii) The company defines the database table

MEALPLAN1(STNO, Y, M, MEALTYPE01, MEALTYPE02, ... , MEALTYPE31)

where the 31 fields, MEALTYPE01, MEALTYPE02, ... , MEALTYPE31, store the meal types for the days of the month M and year Y.

Is MEALPLAN3 better than MEALPLAN1? Explain briefly.

Yes, because mealplan3's data show is what does student eat every day, but mealplan1's data show a whole month meal, ~~the~~ mealplan3 is better than mealplan1 because the data is performance of more convenience

(5 marks)

(d) The records of all meal orders will be analysed using data mining. Suggest an example of data to be mined and explain how it can be used by the company to improve its service.

~~The~~ seperate the meal order by week. It means save the records of one week in a table and save the records of another week in another table. It will be more ~~effi~~ efficiently that the company distribute the meal to the school.

(2 marks)

END OF PAPER

Answers written in the margins will not be marked.

Answers written in the margins will not be marked

Answer all questions.

1. An examination agent designs the following database tables to store the information on candidates who register for examination.

CAND

Field name	Type	Width	Description
CNUM	Character	8	Unique candidate number of the candidate where the first three characters are the unique school code of the candidate's school
CNAME	Character	30	Name of the candidate
DOB	Date		Date of birth of the candidate

REGISTER

Field name	Type	Width	Description
CNUM	Character	8	Candidate number of the candidate who sits the examination of the subject
SCODE	Character	2	Unique subject code

SUBJECT

Field name	Type	Width	Description
SCODE	Character	2	Unique subject code
SNAME	Character	30	Name of the subject

(a) (i) Write a SQL command to create CAND.

~~create table CAND (CNUM char~~

~~create table CAND (CNUM char(8), CNAME char(30),~~

~~DOB date)~~ create table CAND (CNUM CNAME)

(char(8), char(30)) .

(ii) Which of the following can be a candidate key of CAND? Explain briefly.

(1) CNUM (2) CNAME + DOB

CNUM, because it is a unique candidate number of the candidate

2

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(iii) Write a SQL command to create an index file, CIND, for CAND on CNUM. What is the advantage of using this index file?

SQL command: Create Index CIND from CAND (CNUM) 1

Advantage: Searching time of CNUM will be faster. 1

(7 marks)

(b) Identify the primary key(s) and foreign key(s) of REGISTER.

Primary key: SCode.

Foreign key: CNUM, Scode. 2

(3 marks)

(c) (i) Write a SQL command to increase the width of CNUM in CAND to 12. Make sure that CNUM would never be empty.

Alter colume card from cnum (char(12))

(ii) Write a SQL command to list all the candidate names and their corresponding school codes.

Select C.cname, r.scode from register as r, card as C
where R.Cnum = C.cnum

(iii) The subject code and subject name of a new subject are 09 and LAW respectively. Write a SQL command to insert this record into SUBJECT.

Insert into subject (09, LAW).

(6 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2. A database table, CLINIC, stores the information on patients who visit a clinic for treatment. The design of CLINIC is based on the following assumptions:

- There may be some illnesses that no patient ever visits for.
- A doctor can prescribe medicine by zero or more injections for an illness and prescribe medicine by one injection for a number of illnesses.

The fields in CLINIC are shown below:

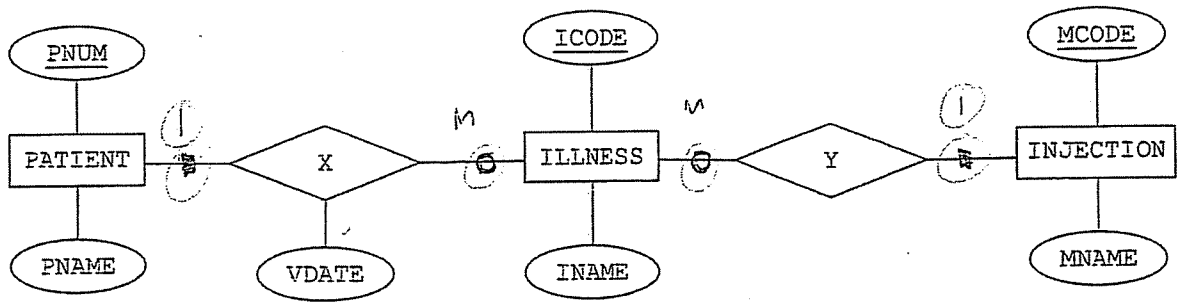
Field name	Description
PNUM	Unique patient number
PNAME	Name of patient
VDATE	Date of the clinic visit
ICODE	Unique illness code
INAME	Name of illness
MCODE	Unique injection code
MNAME	Name of the injection

(a) Explain briefly how the design of CLINIC leads to data redundancy.

The design of clinic leads to partial dependency and transitive dependency. Because the clinic puts all the datas in one table, and some of the datas are not depend on others.

(2 marks)

The incomplete E-R diagram below represents an alternative design for the clinic to fulfill the assumptions.



(b) (i) Give the appropriate words for the relationships in X and Y.

X: got Y: had

(ii) Complete the E-R diagram above.

(5 marks)

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(c) Transform the E-R diagram into the database schemas below.

X([redacted] vdube , PNUM , Icode)

Y(Mcode , Icode)

(4 marks)

(d) Can the alternative design handle an illness without the need for an injection? Explain briefly.

No, because the [redacted] table illness is still connect with table injection, so it will still show the data of injection.

(2 marks)

(e) One day, one type of medicine is prohibited by the government.

(i) Give one problem which will occur when the record of the prohibited medicine is removed from INJECTION in the alternative design.

[redacted] The Mcode in the Y table will still exist.

(ii) Suggest a method of handling prohibited medicines in the alternative design.

[redacted] delete both the data of prohibited medicines in table Y and injection.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. A web site uses the following database tables to store information on restaurants.

RES

Field name	Type	Width	Description	Example of data
RESID	Character	5	Identification code of the restaurant	02173
RESNAME	Character	30	Name of the restaurant	EAA Cafe mini
RATING	Numeric	1	Rating of the restaurant	3
DISTRICT	Character	2	District code of the restaurant	04
CUISINE	Character	2	Cuisine code of the restaurant	07
SPENDING	Numeric	3	Spending per person	80

DIST

Field name	Type	Width	Description	Example of data
DISTRICT	Character	2	District code	04
DISTNAME	Character	30	Name of the district	Wanchai

CUI

Field name	Type	Width	Description	Example of data
CUISINE	Character	2	Cuisine code	07
CUINAME	Character	30	Type of cuisine	Italian

Write SQL commands to complete the tasks in (a) to (e).

(a) List the names and ratings of restaurants with a rating equal to or greater than 3, in descending order of the rating.

```
select resname, rating from res where rating >= "3"
order by rating desc.
```

(3 marks) 2

(b) Calculate the average spending per person of those restaurants with 'Cafe' in their names.

```
select AVG (Spending) from RES where resname
= "* cafe *"
```

(2 marks) 1

(c) List the names of restaurants in the district 'Mongkok'.

```
select resname, ~~district~~ from RES where ~~district~~ =
"Mongkok", select r.resname from RES as r, Dist as d
where d.district = r.district and distname = 'Mongkok'
```

(2 marks) 2

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(d) List the number of restaurants offering Thai cuisine (i.e. `CUINAME = 'Thai'`) in each district.

```
Select count(*), r.district from CUI as C, RES as R
where R.cuisine = C.cuisine and C.cuiname = "Thai"
group by r.district
```

(4 marks)

(e) List the district name which has the largest number of restaurants with a rating greater than 3.

```
select D.distname, from Dist as d, RES as r
where r.district = d.district and D.distname.
select MAX(rating) from RES, where rating > 3)
```

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. A catering service company provides lunches to primary school students. Before the beginning of each month, students fill in a form, as below:

Meal Order Form							
Year/Month: 20 /							
Student name:					HKID number:		
Class:					Class number:		
Fill in meal type (A, B or C) for each day							
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐
9 ☐	10 ☐	11 ☐	12 ☐	13 ☐	14 ☐	15 ☐	16 ☐
17 ☐	18 ☐	19 ☐	20 ☐	21 ☐	22 ☐	23 ☐	24 ☐
25 ☐	26 ☐	27 ☐	28 ☐	29 ☐	30 ☐	31 ☐	
Meal sub-total (Number of meals ordered x $18):							
Meal with juice: Yes / No If yes, add $150.							
TOTAL:							
Payment method (Blacken the square)							
☐ Convenience shop ☐ Cheque ☐ Phone payment							
Transaction / Cheque / Payment number: _____							

(a) The following is ***part*** of a data dictionary that represents the meal order form for one of the schools.

Field name	Data type	Width	Description
SCHNAME	Character	50	School name
STNAME	Character	50	Student name
HKIDNO	Character	11	Student's HKID number
CLASS	Character	2	Class
CLASSNO	x		Class number
JUICE	y		Meal with juice (Yes / No)
TOTAL	Real		Total amount
PAYMETHOD	Character	1	Payment method: C: convenience shop Q: cheque P: phone payment
PAYMENTNO	Character	10	Transaction / Cheque / Payment number

(i) TOTAL seems to be unnecessary in the data dictionary. Why?

Total can be calculated by function

(ii) Other than Character, suggest suitable data types for x and y.

x: integer. y: option.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(iii) Illustrate the domain integrity in the above design.

HKIDNO is a unique key field. and it to use range check in the width. type check in Data type.

(5 marks)

(b) Parents complain about the need to provide HKID numbers and student names. What should the following people do in order to prevent this kind of complaint?

Database designer: Keep the data being privated. don't publizise the data.

Data entry operator: Don't remember the HKID number and student names of students.

(2 marks)

(c) The company serves many schools and wants to store all meal orders. It designs a Third Normal Form (3NF) database table, MEALPLAN3, with the following field names.

Field name	Description
STNO	Unique student number
MEALDATE	Date for the meal
MEALTYPE	Meal type

(i) Explain why MEALPLAN3 is in 3NF.

Because it has no transitive dependency and partial dependency. The data are depend on the relevant & primary key. And there are no repeated data in every records.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(ii) The company defines the database table

`MEALPLAN1(STNO, Y, M, MEALTYPE01, MEALTYPE02, ... , MEALTYPE31)`

where the 31 fields, `MEALTYPE01`, `MEALTYPE02`, ... , `MEALTYPE31`, store the meal types for the days of the month `M` and year `Y`.

Is `MEALPLAN3` better than `MEALPLAN1`? Explain briefly.

Yes, because MEALPLAN1 has partial dependency, it's just in first normal form.

(5 marks)

(d) The records of all meal orders will be analysed using data mining. Suggest an example of data to be mined and explain how it can be used by the company to improve its service.

For example, meal type can be mined, and find out the smallest number of meal type, so the company can find out which meal was less popular and improve its service.

(2 marks)

END OF PAPER

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2

Answers written in the margins will not be marked.

Answer all questions.

1. An examination agent designs the following database tables to store the information on candidates who register for examination.

CAND

Field name	Type	Width	Description
CNUM	Character	8	Unique candidate number of the candidate where the first three characters are the unique school code of the candidate's school
CNAME	Character	30	Name of the candidate
DOB	Date		Date of birth of the candidate

REGISTER

Field name	Type	Width	Description
CNUM	Character	8	Candidate number of the candidate who sits the examination of the subject
SCODE	Character	2	Unique subject code

SUBJECT

Field name	Type	Width	Description
SCODE	Character	2	Unique subject code
SNAME	Character	30	Name of the subject

(a) (i) Write a SQL command to create CAND.

CREAT table CAND
SNUM character (8) primary
CNAME character (30) not null
DOB Date ( ) NULL

(ii) Which of the following can be a candidate key of CAND? Explain briefly.

(1) CNUM (2) CNAME + DOB

CNUM, because CNUM is unique. and the CNAME + DOB may have the same. with others.

2

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(iii) Write a SQL command to create an index file, CIND, for CAND on CNUM. What is the advantage of using this index file?

SQL command: CREAT index CIND on table CNUM (index CAND)

Advantage: It is easily to ~~[illegible]~~ add the file and find the file.

(7 marks)

(b) Identify the primary key(s) and foreign key(s) of REGISTER.

Primary key: SCODE

Foreign key: SNUM

(3 marks)

(c) (i) Write a SQL command to increase the width of CNUM in CAND to 12. Make sure that CNUM would never be empty.

~~UPDATE CAND~~
~~SET CNUM = 12~~
UPDATE CAND
SET CNUMwidth = 12

(ii) Write a SQL command to list all the candidate names and their ~~corresponding~~ school codes

select CNAME, Count (*) from CAND
order by CNUM

(iii) The subject code and subject name of a new subject are 09 and LAW respectively. Write a SQL command to insert this record into SUBJECT.

INSERT INTO SUBJECT ("09", "LAW")
VALUES

(6 marks)

2

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2. A database table, CLINIC, stores the information on patients who visit a clinic for treatment. The desig of CLINIC is based on the following assumptions:

- There may be some illnesses that no patient ever visits for.
- A doctor can prescribe medicine by zero or more injections for an illness and prescribe medicine by one injection for a number of illnesses.

The fields in CLINIC are shown below:

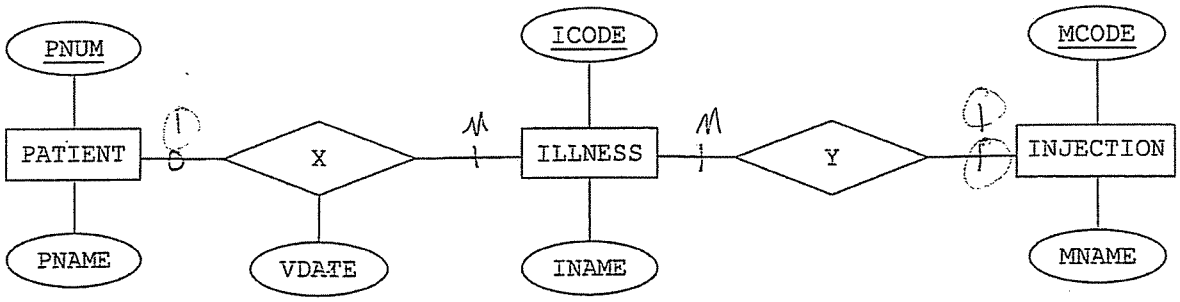
Field name	Description
PNUM	Unique patient number
PNAME	Name of patient ✓
VDATE	Date of the clinic visit ✓
ICODE	Unique illness code
INAME	Name of illness ✓
MCODE	Unique injection code
MNAME	Name of the injection ✓

(a) Explain briefly how the design of CLINIC leads to data redundancy.

The design of CLINIC ~~was~~ was record the code of the illness and injection, and record the number of the patient. In order to find out the data ~~was~~ faster, but it make the data redundancy.

(2 marks)

The incomplete E-R diagram below represents an alternative design for the clinic to fulfill the assumptions.



(b) (i) Give the appropriate words for the relationships in X and Y.

X: visit ✓ Y: again ✓

(ii) Complete the E-R diagram above.

(5 marks)

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2

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(c) Transform the E-R diagram into the database schemas below.

X(VDATE)

Y( )

(4 marks)

(d) Can the alternative design handle an illness without the need for an injection? Explain briefly.

Yes. # Without injection the patient can also handle an illness, but the time of recover ~~are~~ need longer.

(2 marks)

(e) One day, one type of medicine is prohibited by the government.

(i) Give one problem which will occur when the record of the prohibited medicine is removed from INJECTION in the alternative design.

The place of the Unique injection code is ~~become~~ empty

(ii) Suggest a method of handling prohibited medicines in the alternative design.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. A web site uses the following database tables to store information on restaurants.

RES

Field name	Type	Width	Description	Example of data
RESID	Character	5	Identification code of the restaurant	02173
RESNAME	Character	30	Name of the restaurant	EAA Cafe mini
RATING	Numeric	1	Rating of the restaurant	3
DISTRICT	Character	2	District code of the restaurant	04
CUISINE	Character	2	Cuisine code of the restaurant	07
SPENDING	Numeric	3	Spending per person	80

DIST

Field name	Type	Width	Description	Example of data
DISTRICT	Character	2	District code	04
DISTNAME	Character	30	Name of the district	Wanchai

CUI

Field name	Type	Width	Description	Example of data
CUISINE	Character	2	Cuisine code	07
CUINAME	Character	30	Type of cuisine	Italian

Write SQL commands to complete the tasks in (a) to (e).

(a) List the names and ratings of restaurants with a rating equal to or greater than 3, in descending order of the rating.

```
select resname, rating from RES
where rating >= 3
order rating descending
```

(3 marks)

(b) Calculate the average spending per person of those restaurants with 'Cafe' in their names.

```
select average (spending) from res
where resname = "Cafe"
```

(2 marks)

(c) List the names of restaurants in the district 'Mongkok'.

```
select resname from res, dist
where res.resname = dist.distname and distname = "Mongkok"
```

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(d) List the number of restaurants offering Thai cuisine (i.e. `CUINAME = 'Thai'`) in each district.

```
select cuisine , cuiname from res , cui
where res.cuisine = cui.cuisine

group by district

having cuiname
```

(4 marks)

(e) List the district name which has the largest number of restaurants with a rating greater than 3.

```
select disthame , from dist
                max (rating)
where rating > 3
```

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. A catering service company provides lunches to primary school students. Before the beginning of each month, students fill in a form, as below:

Meal Order Form							
Year/Month: 20 /							
Student name:					HKID number:		
Class:					Class number:		
Fill in meal type (A, B or C) for each day							
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐
9 ☐	10 ☐	11 ☐	12 ☐	13 ☐	14 ☐	15 ☐	16 ☐
17 ☐	18 ☐	19 ☐	20 ☐	21 ☐	22 ☐	23 ☐	24 ☐
25 ☐	26 ☐	27 ☐	28 ☐	29 ☐	30 ☐	31 ☐	
Meal sub-total (Number of meals ordered x $18):							
Meal with juice: Yes / No If yes, add $150.							
TOTAL:							
Payment method (Blacken the square)							
☐ Convenience shop ☐ Cheque ☐ Phone payment Transaction / Cheque / Payment number: _____							

(a) The following is ***part*** of a data dictionary that represents the meal order form for one of the schools.

Field name	Data type	Width	Description
SCHNAME	Character	50	School name
STNAME	Character	50	Student name
HKIDNO	Character	11	Student's HKID number
CLASS	Character	2	Class
CLASSNO	x		Class number
JUICE	y		Meal with juice (Yes / No)
TOTAL	Real		Total amount
PAYMETHOD	Character	1	Payment method: C: convenience shop Q: cheque P: phone payment
PAYMENTNO	Character	10	Transaction / Cheque / Payment number

(i) TOTAL seems to be unnecessary in the data dictionary. Why?

Total is useless from data dictionary, because, all data did not need it.

(ii) Other than Character, suggest suitable data types for x and y.

x: Numeric y: character

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(iii) Illustrate the domain integrity in the above design.

(5 marks)

(b) Parents complain about the need to provide HKID numbers and student names. What should the following people do in order to prevent this kind of complaint?

Database designer: should edit more number to HKID number,

Data entry operator: Creat the

(2 marks)

(c) The company serves many schools and wants to store all meal orders. It designs a Third Normal Form (3NF) database table, MEALPLAN3, with the following field names.

Field name	Description
STNO	Unique student number
MEALDATE	Date for the meal
MEALTYPE	Meal type

(i) Explain why MEALPLAN3 is in 3NF.

No multi-value attributes

No attibutes depend on non-key field

No field depend on key field.

2

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(ii) The company defines the database table

```
MEALPLAN1(STNO, Y, M, MEALTYPE01, MEALTYPE02, ... , MEALTYPE31)
```

where the 31 fields, `MEALTYPE01`, `MEALTYPE02`, ... , `MEALTYPE31`, store the meal types for the days of the month `M` and year `Y`.

Is `MEALPLAN3` better than `MEALPLAN1`? Explain briefly.

Yes, due the mealplane 3 is improve the mealtype again. So mealplan 1 is lead to make mealplan 3 better.

(5 marks)

(d) The records of all meal orders will be analysed using data mining. Suggest an example of data to be mined and explain how it can be used by the company to improve its service.

The meal has be order to arranged.

(2 marks)

END OF PAPER

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Answer all questions.

1. An examination agent designs the following database tables to store the information on candidates who register for examination.

CAND

Field name	Type	Width	Description
CNUM	Character	8	Unique candidate number of the candidate where the first three characters are the unique school code of the candidate's school
CNAME	Character	30	Name of the candidate
DOB	Date		Date of birth of the candidate

REGISTER

Field name	Type	Width	Description
CNUM	Character	8	Candidate number of the candidate who sits the examination of the subject
SCODE	Character	2	Unique subject code

SUBJECT

Field name	Type	Width	Description
SCODE	Character	2	Unique subject code
SNAME	Character	30	Name of the subject

(a) (i) Write a SQL command to create CAND.

```
CREATE TABLE CAND
(CNUM , Char(8) Unique)
(CNAME , Char(30) , Not Null)
(DOB , Date , Not null)
```

(ii) Which of the following can be a candidate key of CAND? Explain briefly.

(1) CNUM (2) CNAME + DOB

CNUM, because CNAME + DOB may be same people which name is same, DOB is same.

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(iii) Write a SQL ~~command~~ to create an index file, CIND, for CAND on CNUM. What is the advantage of using this index file?

SQL command: CREATE INDEX CAND ON CNUM (CIND)

Advantage: Easy to search information

(7 marks)

(b) Identify the primary key(s) and foreign key(s) of REGISTER.

Primary key: CNUM

Foreign key: SCODE

(3 marks)

(c) (i) Write a SQL command to increase the width of CNUM in CAND to 12. Make sure that CNUM would never be empty.

Update (AND (CNUM = 12))

(ii) Write a SQL command to list all the candidate names and their corresponding school codes.

Select name, code from REGISTER
group by CNUM

(iii) The subject code and subject name of a new subject are 09 and LAW respectively. Write a SQL command to insert this record into SUBJECT.

INSERT INTO SUBJECT SCODE VALUES = 09 ,
SNAME VALUES = LAW

(6 marks)

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2. A database table, CLINIC, stores the information on patients who visit a clinic for treatment. The desig of CLINIC is based on the following assumptions:

- There may be some illnesses that no patient ever visits for.
- A doctor can prescribe medicine by zero or more injections for an illness and prescribe medicine by one injection for a number of illnesses.

The fields in CLINIC are shown below:

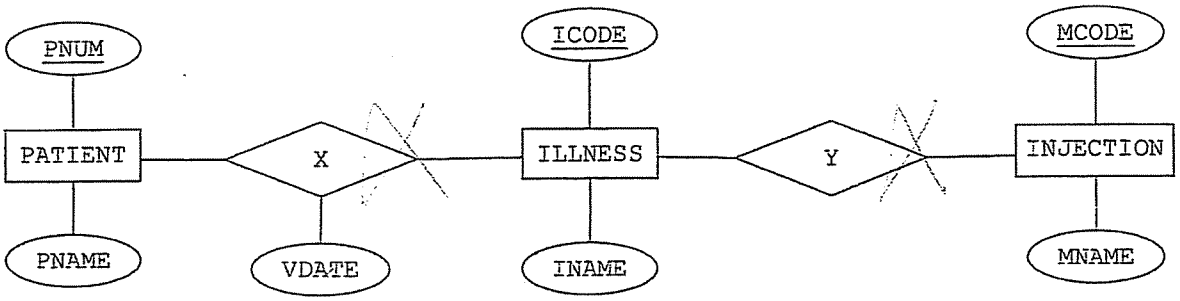
Field name	Description
PNUM	Unique patient number
PNAME	Name of patient
VDATE	Date of the clinic visit
ICODE	Unique illness code
INAME	Name of illness
MCODE	Unique injection code
MNAME	Name of the injection

(a) Explain briefly how the design of CLINIC leads to data redundancy.

No attributes depends on non-key field to design CLINIC.

(2 marks)

The incomplete E-R diagram below represents an alternative design for the clinic to fulfill the assumptions.



(b) (i) Give the appropriate words for the relationships in X and Y.

X: get Y: has

(ii) Complete the E-R diagram above.

(5 marks)

2

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(c) Transform the E-R diagram into the database schemas below.

x(VDATE, PNUM)

y(MCODE, ICODE)

(4 marks)

(d) Can the alternative design handle an illness without the need for an injection? Explain briefly.

Yes

(2 marks)

(e) One day, one type of medicine is prohibited by the government.

(i) Give one problem which will occur when the record of the prohibited medicine is removed from INJECTION in the alternative design.

Someone carelessly remove the information of injection

(ii) Suggest a method of handling prohibited medicines in the alternative design.

Add the password to every files. When someone wants to delete data

(2 marks)

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3. A web site uses the following database tables to store information on restaurants.

RES

Field name	Type	Width	Description	Example of data
RESID	Character	5	Identification code of the restaurant	02173
RESNAME	Character	30	Name of the restaurant	EAA Cafe mini
RATING	Numeric	1	Rating of the restaurant	3
DISTRICT	Character	2	District code of the restaurant	04
CUISINE	Character	2	Cuisine code of the restaurant	07
SPENDING	Numeric	3	Spending per person	80

DIST

Field name	Type	Width	Description	Example of data
DISTRICT	Character	2	District code	04
DISTNAME	Character	30	Name of the district	Wanchai

CUI

Field name	Type	Width	Description	Example of data
CUISINE	Character	2	Cuisine code	07
CUINAME	Character	30	Type of cuisine	Italian

Write SQL commands to complete the tasks in (a) to (e).

(a) List the names and ratings of restaurants with a rating equal to or greater than 3, in descending order of the rating.

```
Select resname. rating from RES.
where rating >. "3"
order by rating.
```

(3 marks)

(b) Calculate the average spending per person of those restaurants with 'Cafe' in their names.

```
Select count (name) from RES
where resname = "% cafe %"
```

(2 marks)

(c) List the names of restaurants in the district 'Mongkok'.

```
Select distname from DIST
Where distname = "Mongkok"
```

(2 marks)

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Answers written in the margins will not be marked.

(d) List the number of restaurants offering Thai cuisine (i.e. `CUINAME = 'Thai'`) in each district.

```
Select count(*), cuiname, cuisine, district from RES, DIST, cui
where res.cuisine = cui.cuisine and res.district = dist.district and
cuiname = "Thai"
group by district
```

(4 marks)

(e) List the district name which has the largest number of restaurants with a rating greater than 3.

```
Select district from res, dist
where res.district = dist.district and max(select
rating from res) > "3"
group by district
```

(4 marks)

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Answers written in the margins will not be marked.

4. A catering service company provides lunches to primary school students. Before the beginning of each month, students fill in a form, as below:

Meal Order Form							
Year/Month: 20 /							
Student name:					HKID number:		
Class:					Class number:		
Fill in meal type (A, B or C) for each day							
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐
9 ☐	10 ☐	11 ☐	12 ☐	13 ☐	14 ☐	15 ☐	16 ☐
17 ☐	18 ☐	19 ☐	20 ☐	21 ☐	22 ☐	23 ☐	24 ☐
25 ☐	26 ☐	27 ☐	28 ☐	29 ☐	30 ☐	31 ☐	
Meal sub-total (Number of meals ordered x $18):							
Meal with juice: Yes / No If yes, add $150.							
TOTAL:							
Payment method (Blacken the square)							
☐ Convenience shop ☐ Cheque ☐ Phone payment Transaction / Cheque / Payment number: _____							

(a) The following is ***part*** of a data dictionary that represents the meal order form for one of the schools.

Field name	Data type	Width	Description
SCHNAME	Character	50	School name
STNAME	Character	50	Student name
HKIDNO	Character	11	Student's HKID number
CLASS	Character	2	Class
CLASSNO	*x*		Class number
JUICE	*y*		Meal with juice (Yes / No)
TOTAL	Real		Total amount
PAYMETHOD	Character	1	Payment method: C: convenience shop Q: cheque P: phone payment
PAYMENTNO	Character	10	Transaction / Cheque / Payment number

(i) TOTAL seems to be unnecessary in the data dictionary. Why?

Because it can be changed anytime.

(ii) Other than Character, suggest suitable data types for *x* and *y*.

x: Numeric *y*: Logical

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(iii) Illustrate the domain integrity in the above design.

(5 marks)

(b) Parents complain about the need to provide HKID numbers and student names. What should the following people do in order to prevent this kind of complaint?

Database designer: Change it to show only first four character of HKID and give up to provide student names.

Data entry operator: Enter all HKID numbers but hide the last four characters.

(2 marks)

(c) The company serves many schools and wants to store all meal orders. It designs a Third Normal Form (3NF) database table, MEALPLAN3, with the following field names.

Field name	Description
STNO	Unique student number
MEALDATE	Date for the meal
MEALTYPE	Meal type

(i) Explain why MEALPLAN3 is in 3NF.

It is because the relationship of them have no 'Many to Many'.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(ii) The company defines the database table

```
MEALPLAN1(STNO, Y, M, MEALTYPE01, MEALTYPE02, ... , MEALTYPE31)
```

where the 31 fields, `MEALTYPE01`, `MEALTYPE02`, ... , `MEALTYPE31`, store the meal types for the days of the month `M` and year `Y`.

Is `MEALPLAN3` better than `MEALPLAN1`? Explain briefly.

It can not compare. X

Every mealplan have the special way. ✓

(5 marks)

(d) The records of all meal orders will be analysed using data mining. Suggest an example of data to be mined and explain how it can be used by the company to improve its service.

Update the information. ✓ X

(2 marks)

END OF PAPER

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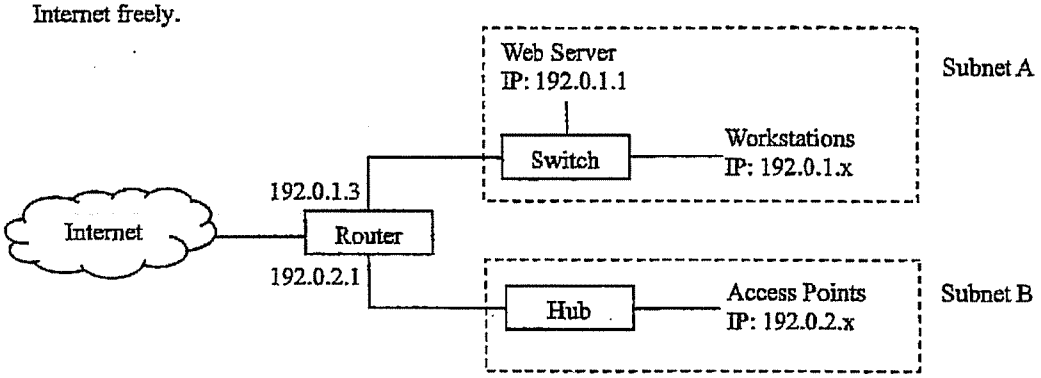
ICT 2B M

Answer all questions.

1. Ada is a network administrator. She sets up a network for a museum. The network is divided into two subnets, Subnet A and Subnet B. Subnet A consists of a web server and a number of workstations for the staff. Subnet B consists of a number of wireless access points (APs) for visitors to use to connect to the Internet freely.



(a) What kind of network topology is used in this network? Give one advantage and one disadvantage of this topology.

Network topology: Star topology 1

Advantage: All signals are ~~sended~~ sent to a ~~data~~ central controller. It can ~~prevent~~ data send to other ~~for~~ destination.

Disadvantage: If the centre controller fails all the ~~comp~~ workstation cannot get access to the ~~serve~~ 1

(3 marks)

(b) Ada wants to replace the hub in Subnet B with a switch. Give **two** advantages of a switch over a hub.

The data transmission speed is same in switch.

More computers can connect to the switch more than a hub.

(2 marks)

(c) (i) Name the devices in Subnet B using CSMA/CD and CSMA/CA.

CSMA/CD: Hub

CSMA/CA: Access Point. 2

(ii) Ada finds that the network throughput decreases greatly when the number of connections to the APs increases by only two. Why?

The bandwidth is ~~AA~~ large enough to Enhance the data transmission

(4 marks)

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(d) In Subnet A, the IP address of the switch is 192.0.1.2 and the IP addresses of the workstations range from 192.0.1.4 to 192.0.1.21.

(i) Which class of IP addresses is being used? Class C (1)

(ii) Give the subnet mask and default gateway.

Subnet mask: 255.255.255.0 (1)

Default gateway: 192.0.1.0

(iii) Suggest a method for assigning IP addresses to the workstations in Subnet A. Give one advantage and one disadvantage of your suggestion.

Set up a DHCP server. (3)

Advantage : centralized the control of IP address

Disadvantage : If the DHCP server fails, the device cannot gain IP address.

(iv) In terms of IP address translation, explain how the web server in Subnet A can be accessed via the Internet.

The request will send to the router, and the router will route the request to the switch, and the switch send the request to 192.0.1.1

(7 marks)

(e) A USB printer is to be shared among the workstations in Subnet A.

(i) Describe, step by step, how to share the printer among the workstations. (1)

First, connect the printer to one of the workstation and share the printer to the network through the workstation.

(ii) Give one disadvantage of the printer sharing in (e)(i).

If the workstation which connect to the printer is off, other workstation on the network cannot use the printer. (1)

(3 marks)

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2. Peter is the network administrator in a secondary school.

(a) Peter wants to find a solution for each of the following problems:

P1: the spread of computer viruses due to the use of USB flash memory
P2: data loss due to the accidental deletion of files stored in a server
P3: data loss due to the accidental breakdown of a hard disk
P4: the impact on the servers of the accidental cut-off of electricity supply

Complete the following table to show the hardware / software required for solving the problems and describe the solutions briefly.

	Hardware / Software required	Description
P1	Anti-Virus Software	The software can detect the virus in the computer and remove the viruses.
P2	~~Recover server~~ RAID	~~Recovery~~ Recover the data to the Server.
P3	~~Backup server~~ Backup harddisk.	~~Use to recover all the~~ Use to recover the data once the ~~server~~ harddisk is break down.
P4	~~UPS~~ UPS (1)	Provide backup power for the server. It contain some power ~~to~~ and provide to the server.

(8 marks)

(b) One day, some teachers report that they cannot access the school web site from the workstations in the school.

In each of the following scenarios, what kind of hardware problem can Peter deduce?

(i) The teachers can browse other web pages in the Internet.

The web server fails. (1)

(ii) The teachers can browse the school web pages by using its public IP address.

Domain name server fails. (1)

(iii) The teachers fail to access the Internet using IP addresses of web sites, but they can access all the school network resources.

The DHCP server ~~is out of~~ fails.

(3 marks)

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(c) A teacher connects his own notebook computer to the school network but he cannot access the Internet and school network resources. Describe how Peter uses some commands and/or utility programs to diagnose and solve the networking problems.

He can use ~~some~~ network detection software, to test the connection between computer and network. Also, he can use the CMD to run "ipconfig" to test whether his computer had connected to the network.

(4 marks)

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3. Mr Li sets up a computer network in a secondary school. He wants to set the following restrictions:

R1: Forbid students to browse the web sites with indecent materials.
R2: Forbid students to use the workstations to communicate with external computers directly.
R3: Forbid students to download files from the Internet using the FTP.
R4: Forbid students to install software in the workstations.

(a) Mr Li can use either a proxy server or a firewall to set R1. The two devices adopt content filtering and packet filtering respectively.

(i) How do the proxy server and the firewall perform filtering differently?

Proxy server only block the connection which the network administrator set.
Firewall can block the connection which contain. ~~use~~ unauthorized content

(ii) Mr Li considers using the proxy server only. Give one advantage and one disadvantage.

Advantage : Prevent explose of user's identity to the outside network.
Disadvantage : The server-grade proxy server is expensive.

(4 marks)

(b) Describe how Mr Li administers the network so as to set the following restrictions.

(i) R2: Block all the connection to the outside through the firewall.

(ii) R3: Block the FTP port, so that FTP software cannot communicate other network (1)

(iii) R4: limit the right of the student's account. (1)

(6 marks)

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Answers written in the margins will not be marked.

(c) To make the maintenance of the computers easier, Mr Li needs to access the school network through the Internet. Hence, he needs to establish a secure channel for transferring data.

(i) Suggest a method that Mr Li could use.

Use remote control software

(ii) Give **two** disadvantages of the suggestion in (c)(i).

The control the speed will be affected

Connection speed will be affected if

the network bandwidth is not large enough.

(3 marks)

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Answers written in the margins will not be marked.

4. Mary is a network administrator. She is setting up a wireless network with a number of wireless access points (APs) in a library. Hence, readers can use their own mobile devices to connect to the Internet.

(a) (i) Other than a notebook computer, suggest two kinds of mobile devices that can connect to the APs.

PDAs, Smart phone (2)

(ii) Which hardware component in these mobile devices is the key part for the Internet connection?

Wireless NICs. (1)

(3 marks)

Mary sets up two wireless local area networks, LIB-Y5a and LIB-Y5b, in the library for testing purposes. She uses a notebook computer to detect the wireless networks and has the following results:

SSID	Signal
LIB-Y5a (X) *Unsecured wireless network*	✦✦✦✦✦✧
PUB-Y5 *Unsecured wireless network*	✦✦✧✧✧✧
LIB-Y5b (✓) *Security-enabled wireless network*	✦✦✦✦✦✦
HKEAA1 *Security-enabled wireless network*	✦✧✧✧✧✧
eaa *Security-enabled wireless network*	✦✦✦✧✧✧

(b) (i) Must the Service Set Identifier (SSID) of the wireless networks detected be unique? Explain your answer briefly.

Yes. If the SSID is not unique The device cannot identify which SSID should they connect to.

(ii) Why can some other wireless networks be detected?

It is because they choose to broadcast their SSID in the router setting. (1)

(3 marks)

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Mary suggests two methods of connecting to a wireless network that can improve the network security, as illustrated in Figure 1 and Figure 2 below.

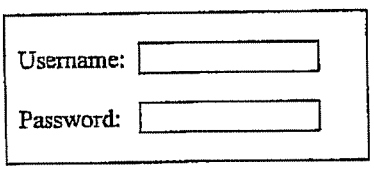

Figure 1

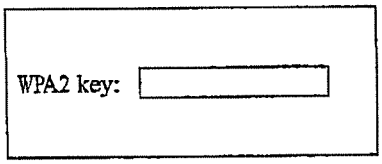

Figure 2

(c) (i) In each of the following boxes, put a '✓' if the corresponding method can be implemented for the network. Otherwise, put a '×'.

	LIB-Y5a	LIB-Y5b
Figure 1	✓	✓
Figure 2	×	✓

✓ ✓ 2

(ii) What is the main purpose of each method in maintaining the network security?

Figure 1: User need ~~to~~ to enter an user name and password before enter the SSID set up page.

Figure 2: User need to enter a WPA2 key before connect to the SSID

(iii) Does the method illustrated in Figure 1 require extra service or hardware? If yes, what?

Login server.
Yes.

(5 marks)

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Answers written in the margins will not be marked.

(d) Peter is a reader. His computer detects the SSID of the free wireless network provided by the library. His friends successfully connect to the network but he is unable to connect. Give **two** network-related reasons for this.

- The ~~set~~ access point's ~~has set a~~ maximum connection the ~~do~~ IP ~~host~~ has IP address has ~~already~~ ~~do~~ all delieved ~~delived~~, So Peter cannot get ~~access to~~ an IP address. (1)
- The Access-point has reached the maximum connection.

(2 marks)

END OF PAPER

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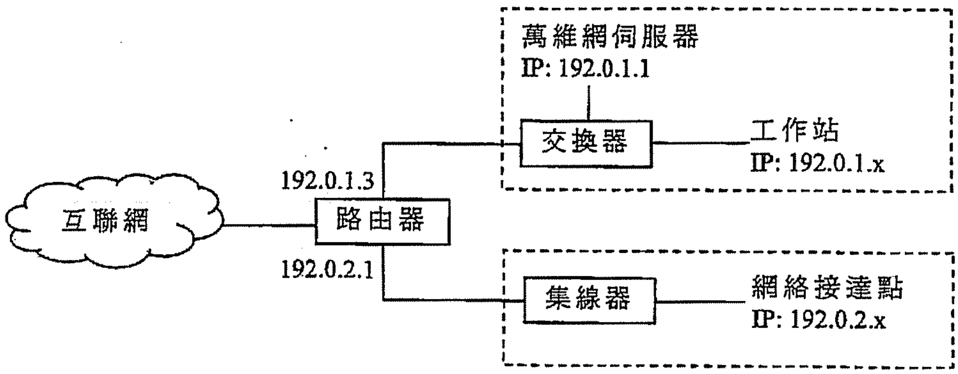
本試卷全部試題均須回答。

1. 小芬是一個網絡管理員，她在某博物館建立了一個網絡。這個網絡分爲兩個子網絡：子網絡 A 和子網絡 B。子網絡 A 包含一個萬維網伺服器和一些供員工使用的工作站。子網絡 B 包含一些供參觀人仕免費連接至互聯網的無線網絡接達點 (AP)。



(a) 這個網絡採用了哪種網絡布局？試指出這種布局的一個優點和一個缺點。

網絡布局：星形佈局

優點：佈局其中電腦損壞不影響 ~~佈局~~ 網絡運作

缺點：中央設備不能壞掉。

(3 分)

(b) 小芬希望以交換器取代子網絡 B 中的集線器。試指出交換器勝於集線器的**兩個**優點。

交換器可設定 ~~進行傳輸~~ 封包的目的地。交換器 保安較強

(2 分)

(c) (i) 指出在子網絡 B 中使用 CSMA/CD 及 CSMA/CA 的設備。

CSMA/CD：AP

CSMA/CA：橋接器

(ii) 小芬發現當再多兩個設備連接到 AP 時，網絡輸貫量嚴重下降。爲什麼？

因為 AP的連接量 ~~不能~~ 會有限，不能有過多設備連入

(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

請在此貼上電腦條碼

(d) 在子網絡 A，交換器的 IP 位址是 192.0.1.2，而工作站的 IP 位址範圍是從 192.0.1.4 至 192.0.1.21。

(i) 哪一類 IP 位址在使用中？ 私用IP地址

(ii) 試寫出其子網絡遮罩及預設通訊閘。

子網絡遮罩： 192.0.1.255

預設通訊閘： 192.0.1.4

(iii) 試建議一個方法，向子網絡 A 內的工作站分派 IP 位址，並指出這項建議的一個優點和一個缺點。

設立 DHCP伺服器。優點：IP地址不會出現重複。

缺點：首次輸入需人手設定分配IP地址的範圍。

(iv) 試從 IP 位址轉譯方面，解釋如何透過互聯網連接到子網絡 A 中的萬維網伺服器。

萬維網伺服器會把網址記下，然後在有用戶連接時，把網址的地址轉換為持有電腦IP地址。

(7 分)

(e) 子網絡 A 的工作站要共用一個 USB 打印機。

(i) 試以步驟說明工作站之間可如何共用此台打印機。

1. 透過內聯網把需列印的資料連接打印機。2. 打印機自動排列打印次序。(如多個工作站需列印也會自動排列打印次序。)

(ii) 試指出 (e)(i) 部分的打印機共用方法的一個缺點。

有些打印機沒有自動排列打印次序。

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

2. 小明是一所中學的網絡管理員。

(a) 小明打算爲以下每個問題找出一個解決方案：

P1： 因使用 USB 快閃記憶體而傳播電腦病毒
P2： 因意外刪除了伺服器內的檔案而丟失數據
P3： 因硬盤意外損毀而丟失數據
P4： 因意外切斷電力供應而對伺服器的影響

完成下表以顯示解決這些問題時所需的硬件／軟件，並簡略說明相關的解決方案。

	所需硬件／軟件	說明
P1	防毒軟件	可防止電腦病毒入侵，自動掃查電腦是否有電腦病毒，
P2	備份軟件	對資料備份，可防止意外刪除資料。
P3	~~設檔案伺服器~~ ~~備份軟件~~	對資料備份，防止意外遺失。
P4	~~裝設硬件—後備~~ 電腦 ~~電池~~ 備份軟件	自動備份伺服器資料，防止切斷電力使伺服器資料遺失。

(8 分)

(b) 一天，有些教師報告說，他們無法從學校的工作站連接到學校網站。

從下列各個情況，小明可推斷出什麼類別的硬件問題？

(i) 這些教師可以瀏覽互聯網上其他網頁。

交換器無法連入學校的網頁伺服器。

(ii) 這些教師可以利用公用 IP 位址瀏覽學校的網頁。

DHCP伺服器損壞無法提供公用IP。

(iii) 這些教師無法利用 IP 位址連接到互聯網上的網站，但他們可以接達學校所有網絡資源。

路由器損壞無法以公用IP連接互聯網。

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

請在此貼上電腦條碼

(c) 一位老師利用自己的手提電腦連接到學校的網絡，但他不能連接到互聯網和學校的網絡資源。試描述小明如何使用一些命令和／或實用程式來診斷和解決這個網絡問題。

小明可以向學校內的電腦使用ping命令來測試連接。

1

（4 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

3. 李先生在一所中學建立了一個電腦網絡，他打算制訂下列限制：

R1： 禁止學生瀏覽具不雅資訊的網站。
R2： 禁止學生利用工作站與外來的電腦直接通訊。
R3： 禁止學生從互聯網以 FTP 下載檔案。
R4： 禁止學生在工作站安裝軟件。

(a) 李先生可以使用代理伺服器或防火牆來制訂 R1，這兩項設備分別採用內容過濾和數據包過濾。

(i) 此代理伺服器和防火牆是如何進行不同的過濾？

代理伺服器限制IP地址來源的連結。
防火牆限制埠的連結。

(ii) 李先生考慮只使用此代理伺服器。試舉出一個優點及一個缺點。

優點：節省設定防火牆的時間。
缺點：無法有效保R1的限制。

（4 分）

(b) 試描述李先生是如何管理此網絡來制訂下列限制。

(i) R2： 防火牆限制連結 1

(ii) R3： 用戶~~設置權~~權限，令學生不能以FTP下載檔案。

(iii) R4： 利用本部限，限制學生不能在工作站進行安裝。 1

（6 分）

寫於邊界以外的答案，將不予評閱。

(c) 李先生需透過互聯網接達學校的網絡，使電腦維修保養工作更容易。因此，他需要建立一條安全的通道以傳輸數據。

(i) 試建議李先生一個可行的方法。

利用遠程監控程式

(ii) 試指出 (c)(i) 建議的**兩個**缺點。

1. 容易受連線速度影響。 (1)

2. 需人手設定密碼連接。

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

4. 小美是一個網絡管理員，她正爲圖書館建立一個附有數個無線網絡接達點 (AP) 的無線網絡。這樣，讀者便可將自己的流動設備連接至互聯網。

(a) (i) 除手提電腦外，試舉出**兩種**可以連接到 AP 的流動設備。

手提電話 ~~手機~~ 和 ~~遊戲機~~ 可使用 Wi-fi 的遊戲機 (如 PSP 等)

(ii) 在這些流動設備內，哪個硬件部件是連接互聯網的關鍵？

無線網絡 ~~網絡~~ 界面卡

(3 分)

小美設置了兩個無線局部區域網絡 LIB-Y5a 和 LIB-Y5b，並在圖書館內進行測試。她使用手提電腦檢測無線網絡後有以下結果：

SSID	強度
LIB-Y5a *無安全性的無線網絡*	✦✦✦✦✦✧
PUB-Y5 *無安全性的無線網絡*	✦✦✧✧✧✧
LIB-Y5b *啓用安全性的無線網絡*	✦✦✦✦✦✦
HKEAA1 *啓用安全性的無線網絡*	✦✧✧✧✧✧
eaa *啓用安全性的無線網絡*	✦✦✦✧✧✧

(b) (i) 所檢測到的無線網絡的服務設定識別碼 (Service Set Identifier, SSID) 是否必須是獨有的？試簡單解釋。

是獨有的，此為服務識別的。

(ii) 爲什麼會檢測到一些其他無線網絡？

因為其他無線網絡同樣覆蓋此地點

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

小美建議兩種安全性較高的方法連接無線網絡，如下列圖 1 和圖 2 所示。

用戶名稱：[ ]

密碼：[ ]

圖 1

WPA2 匙：[ ]

圖 2

(c) (i) 在下列每個方格內，若有關方法可於相關網絡採用，便填上「✓」，否則填上「×」。

	LIB-Y5a	LIB-Y5b
圖 1	✓	✓
圖 2	×	✓

2

(ii) 每個方法在維護網絡安全上的主要目的是什麼？

圖 1：確保沒有其他非用戶連接。

圖 2：增強安全性，防止黑客盜取用戶及密碼後使用無線網絡。

(iii) 圖 1 所示的方法是否需要額外的服務或硬件？如有，它是什麼？

是，需要設定用戶伺服器和用戶資料儲存。

(5 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(d) 小強是一位讀者，他的電腦檢測到圖書館免費提供的無線網絡的 SSID。小強的朋友均能成功連接這個網絡，但他卻未能成功連線。試舉出**兩個**與網絡有關的可能原因。

1. AP連接數達上限。

2. 小強的位址在AP的範圍之外。

（2 分）

試卷完

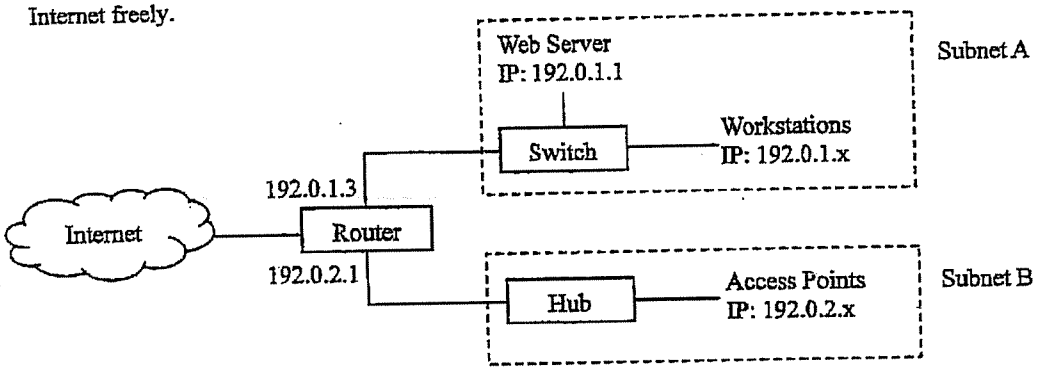
寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

Answer all questions.

1. Ada is a network administrator. She sets up a network for a museum. The network is divided into two subnets, Subnet A and Subnet B. Subnet A consists of a web server and a number of workstations for the staff. Subnet B consists of a number of wireless access points (APs) for visitors to use to connect to the Internet freely.



(a) What kind of network topology is used in this network? Give one advantage and one disadvantage of this topology.

Network topology: ~~logical bus~~ Star topology. (1)

Advantage: ~~less cabling~~ Scalable ?

Disadvantage: ~~Single point~~ Single ~~point~~ point of failure. (1)

(3 marks)

(b) Ada wants to replace the hub in Subnet B with a switch. Give **two** advantages of a switch over a hub.

Better performance and ~~it can~~ connect more computers.

(2 marks)

(c) (i) Name the devices in Subnet B using CSMA/CD and CSMA/CA.

CSMA/CD: ~~bridge~~ transmission medium. (1)

CSMA/CA: ~~repeater~~ ~~ass~~ access point.

(ii) Ada finds that the network throughput decreases greatly when the number of connections to the APs increases by only two. Why?

The Server may not stable.

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

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(d) In Subnet A, the IP address of the switch is 192.0.1.2 and the IP addresses of the workstations range from 192.0.1.4 to 192.0.1.21.

(i) Which class of IP addresses is being used? class C (1)

(ii) Give the subnet mask and default gateway. (2)

Subnet mask: 255.255.255.0

Default gateway: 192.0.1.3

(iii) Suggest a method for assigning IP addresses to the workstations in Subnet A. Give one advantage and one disadvantage of your suggestion.

Connect by cables.

(iv) In terms of IP address translation, explain how the web server in Subnet A can be accessed via the Internet.

(7 marks)

(e) A USB printer is to be shared among the workstations in Subnet A.

(i) Describe, step by step, how to share the printer among the workstations.

The printer may connect to the server first by transmission media or switch. Then more computers more use the printer.

(ii) Give one disadvantage of the printer sharing in (e)(i).

The printer can't all the work from the workstation.

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2. Peter is the network administrator in a secondary school.

(a) Peter wants to find a solution for each of the following problems:

P1: the spread of computer viruses due to the use of USB flash memory
P2: data loss due to the accidental deletion of files stored in a server
P3: data loss due to the accidental breakdown of a hard disk
P4: the impact on the servers of the accidental cut-off of electricity supply

Complete the following table to show the hardware / software required for solving the problems and describe the solutions briefly.

	Hardware / Software required	Description
P1	Anti-viruses software	It is a kind of utility software that is used to detect and remove malware in a computer.
P2	backup server	
P3	RAID Card 1	
P4	UPS 1	~~[illegible]~~ provides fault tolerance for a ~~[illegible]~~ normal power supply 1

(8 marks)

(b) One day, some teachers report that they cannot access the school web site from the workstations in the school.

In each of the following scenarios, what kind of hardware problem can Peter deduce? 1

(i) The teachers can browse other web pages in the Internet.

The web server of the school web site has a problem.

(ii) The teachers can browse the school web pages by using its public IP address.

The ~~network~~ DNS server ~~have~~ has a problem. 1

(iii) The teachers fail to access the Internet using IP addresses of web sites, but they can access all the school network resources.

The web browser has a problem.

(3 marks)

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Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

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(c) A teacher connects his own notebook computer to the school network but he cannot access the Internet and school network resources. Describe how Peter uses some commands and/or utility programs to diagnose and solve the networking problems.

He may connect by Wifi in the school or find someone to recover the server problem of the school web site.

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. Mr Li sets up a computer network in a secondary school. He wants to set the following restrictions:

R1: Forbid students to browse the web sites with indecent materials.
R2: Forbid students to use the workstations to communicate with external computers directly.
R3: Forbid students to download files from the Internet using the FTP.
R4: Forbid students to install software in the workstations.

(a) Mr Li can use either a proxy server or a firewall to set R1. The two devices adopt content filtering and packet filtering respectively.

(i) How do the proxy server and the firewall perform filtering differently?

Proxy server can remain anonymous to the outside servers. Firewall enhance the security of the network.

(ii) Mr Li considers using the proxy server only. Give one advantage and one disadvantage.

It protect the client exposing their identity to outside networks, but it is the higher installation cost imposed and problem of being a single point of failure.

(4 marks)

(b) Describe how Mr Li administers the network so as to set the following restrictions.

(i) R2: Set Two different domain.

(ii) R3: Block the service of FTP.

(iii) R4: Set the user right that can't student install software.

(1)

(6 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) To make the maintenance of the computers easier, Mr Li needs to access the school network through the Internet. Hence, he needs to establish a secure channel for transferring data.

(i) Suggest a method that Mr Li could use.

a) Connect by VPN (1)

(ii) Give **two** disadvantages of the suggestion in (c)(i).

~~less secure and less stable~~

b) It is very expensive and inflexible

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. Mary is a network administrator. She is setting up a wireless network with a number of wireless access points (APs) in a library. Hence, readers can use their own mobile devices to connect to the Internet.

(a) (i) Other than a notebook computer, suggest two kinds of mobile devices that can connect to the APs.

Smartphone, and ~~notebook~~ ~~laptop~~ ~~tablet~~ tablet PC (2)

(ii) Which hardware component in these mobile devices is the key part for the Internet connection?

Network adapter.

(3 marks)

Mary sets up two wireless local area networks, LIB-Y5a and LIB-Y5b, in the library for testing purposes. She uses a notebook computer to detect the wireless networks and has the following results:

[illegible]	[illegible]
LIB-Y5a *Unsecured wireless network*	✦✦✦✦✦✦
PUB-Y5 *Unsecured wireless network*	✦✦✦✦✦✦
LIB-Y5b *Security-enabled wireless network*	✦✦✦✦✦✦
HKEAA1 *Security-enabled wireless network*	✦✦✦✦✦✦
eaa *Security-enabled wireless network*	✦✦✦✦✦✦

(b) (i) Must the Service Set Identifier (SSID) of the wireless networks detected be unique? Explain your answer briefly.

~~No~~, ~~if~~ two ~~use~~ access points ~~can~~ use the same access ID with ~~the~~ same password. (different)

(ii) Why can some other wireless networks be detected?

It is ~~because~~ because ~~they~~ ~~have~~ haven't been hidden. (the other networks.)

(3 marks)

(4)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Mary suggests two methods of connecting to a wireless network that can improve the network security, as illustrated in Figure 1 and Figure 2 below.

Username:	
Password:	

Figure 1

WPA2 key:	

Figure 2

(c) (i) In each of the following boxes, put a '✓' if the corresponding method can be implemented for the network. Otherwise, put a '✗'.

	LIB-Y5a	LIB-Y5b
Figure 1	✓	✓
Figure 2	✓	✓

✓ ✗ 1

(ii) What is the main purpose of each method in maintaining the network security?

Figure 1: It is for domain controll. ✗

Figure 2: Provide secure transmission media. ✗

(iii) Does the method illustrated in Figure 1 require extra service or hardware? If yes, what?

No, it is because it for increase the security level ✗

(5 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(d) Peter is a reader. His computer detects the SSID of the free wireless network provided by the library. His friends successfully connect to the network but he is unable to connect. Give two network-related reasons for this.

The IP address ~~have~~ has a limit access use, so he can't access ~~a~~ to the Internet. ~~And~~ And the wireless network device is not stable.

(2 marks)

END OF PAPER

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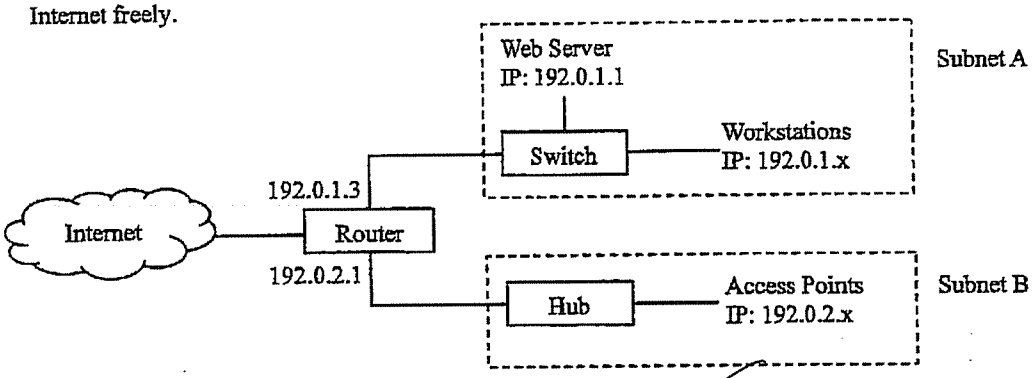
Answer all questions.

1. Ada is a network administrator. She sets up a network for a museum. The network is divided into two subnets, Subnet A and Subnet B. Subnet A consists of a web server and a number of workstations for the staff. Subnet B consists of a number of wireless access points (APs) for visitors to use to connect to the Internet freely.



(a) What kind of network topology is used in this network? Give one advantage and one disadvantage of this topology.

Network topology: Physical star topology

Advantage: Centralize management of data 1

Disadvantage: When the central of the topology is interrupt, all devices in the topology will be interrupted (3 marks)

(b) Ada wants to replace the hub in Subnet B with a switch. Give **two** advantages of a switch over a hub.

- Using Switch can transmit the data in two sides but hub can transmit data single way only.

(2 marks)

(c) (i) Name the devices in Subnet B using CSMA/CD and CSMA/CA.

CSMA/CD: Router

CSMA/CA: Hub

(ii) Ada finds that the network throughput decreases greatly when the number of connections to the APs increases by only two. Why?

(4 marks)

Answers written in the margins will not be marked.

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(d) In Subnet A, the IP address of the switch is 192.0.1.2 and the IP addresses of the workstations range from 192.0.1.4 to 192.0.1.21.

(i) Which class of IP addresses is being used? Class C (1)

(ii) Give the subnet mask and default gateway.

Subnet mask: 192.0.1.0

Default gateway: 192.0.1.1

(iii) Suggest a method for assigning IP addresses to the workstations in Subnet A. Give one advantage and one disadvantage of your suggestion.

(iv) In terms of IP address translation, explain how the web server in Subnet A can be accessed via the Internet.

(7 marks)

(e) A USB printer is to be shared among the workstations in Subnet A.

(i) Describe, step by step, how to share the printer among the workstations.

Connect the workstations and the printer through the network in the subnet, then change the setting of the workstations to use the printer to print.

(ii) Give one disadvantage of the printer sharing in (e)(i).

It may be jammed if some workstations give out the demand to print by the printer at the same time.

(3 marks)

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2. Peter is the network administrator in a secondary school.

(a) Peter wants to find a solution for each of the following problems:

P1: the spread of computer viruses due to the use of USB flash memory
P2: data loss due to the accidental deletion of files stored in a server
P3: data loss due to the accidental breakdown of a hard disk
P4: the impact on the servers of the accidental cut-off of electricity supply

Complete the following table to show the hardware / software required for solving the problems and describe the solutions briefly.

	Hardware / Software required	Description
P1	Anti-virus software	Using anti-virus software to scan
P2	RAID	Recover the data lost.
P3	Harddisk for Backup	Backup the data of the harddisk
P4	UPS. (1)	Backup the power

(8 marks)

(b) One day, some teachers report that they cannot access the school web site from the workstations in the school.

In each of the following scenarios, what kind of hardware problem can Peter deduce?

(i) The teachers can browse other web pages in the Internet.

Failure of the web server (1)

(ii) The teachers can browse the school web pages by using its public IP address.

Failure of the Domain server.

(iii) The teachers fail to access the Internet using IP addresses of web sites, but they can access all the school network resources.

Failure of DHCP

(3 marks)

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(c) A teacher connects his own notebook computer to the school network but he cannot access the Internet and school network resources. Describe how Peter uses some commands and/or utility programs to diagnose and solve the networking problems.

(4 marks)

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3. Mr Li sets up a computer network in a secondary school. He wants to set the following restrictions:

R1: Forbid students to browse the web sites with indecent materials.
R2: Forbid students to use the workstations to communicate with external computers directly.
R3: Forbid students to download files from the Internet using the FTP.
R4: Forbid students to install software in the workstations.

(a) Mr Li can use either a proxy server or a firewall to set R1. The two devices adopt content filtering and packet filtering respectively.

(i) How do the proxy server and the firewall perform filtering differently?

~~Proxy~~ - Detect and block viruses

(ii) Mr Li considers using the proxy server only. Give one advantage and one disadvantage.

Advantage: Clients can be protected from exposing to outside network.

Disadvantage: The cost of Machine of server-grade is high.

(4 marks)

(b) Describe how Mr Li administers the network so as to set the following restrictions.

(i) R2: Ensure students cannot access another unauthorized site

(ii) R3:

(iii) R4:

(6 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) To make the maintenance of the computers easier, Mr Li needs to access the school network through the Internet. Hence, he needs to establish a secure channel for transferring data.

(i) Suggest a method that Mr Li could use.

Using remote control.

(ii) Give **two** disadvantages of the suggestion in (c)(i).

(3 marks)

Answers written in the margins will not be marked.

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Go on to the next page

4. Mary is a network administrator. She is setting up a wireless network with a number of wireless access points (APs) in a library. Hence, readers can use their own mobile devices to connect to the Internet.

(a) (i) Other than a notebook computer, suggest **two** kinds of mobile devices that can connect to the APs.

- Smart phones
- Tablet

(2)

(ii) Which hardware component in these mobile devices is the key part for the Internet connection?

Access point

(3 marks)

Mary sets up two wireless local area networks, LIB-Y5a and LIB-Y5b, in the library for testing purposes. She uses a notebook computer to detect the wireless networks and has the following results:

LIB-Y5a *Unsecured wireless network*	✦✦✦✦✦✦
PUB-Y5 *Unsecured wireless network*	✦✦✦✦✦✦
LIB-Y5b *Security-enabled wireless network*	✦✦✦✦✦✦
HKEAA1 *Security-enabled wireless network*	✦✦✦✦✦✦
eaa *Security-enabled wireless network*	✦✦✦✦✦✦

(b) (i) Must the Service Set Identifier (SSID) of the wireless networks detected be unique? Explain your answer briefly.

No, because ~~SSID~~ the wireless device can detect the SSID which strength enough to be detected.

(1)

(ii) Why can some other wireless networks be detected?

It is because the access point of the other networks are near the place of the notebook computer.

(1)

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Mary suggests two methods of connecting to a wireless network that can improve the network security, as illustrated in Figure 1 and Figure 2 below.

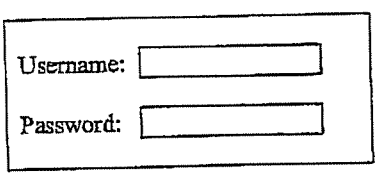


Figure 1

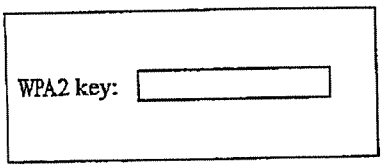


Figure 2

(c) (i) In each of the following boxes, put a '✓' if the corresponding method can be implemented for the network. Otherwise, put a '✗'.

	LIB-Y5a	LIB-Y5b
Figure 1	✓	✓
Figure 2	✗	✓

✓ ✓ (2)

(ii) What is the main purpose of each method in maintaining the network security? (1)

Figure 1: ~~Using~~ People with authorized access the network using their unique identity in order to decrease the possibility of unauthorized access

Figure 2: People have less chance to get the key instead of using password to access the network

(iii) Does the method illustrated in Figure 1 require extra service or hardware? If yes, what?

Yes. If the method illustrated in Figure 1 using login server is required.

(5 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(d) Peter is a reader. His computer detects the SSID of the free wireless network provided by the library. His friends successfully connect to the network but he is unable to connect. Give **two** network-related reasons for this.

- The IP was ~~totally~~ distributed.

-

(2 marks)

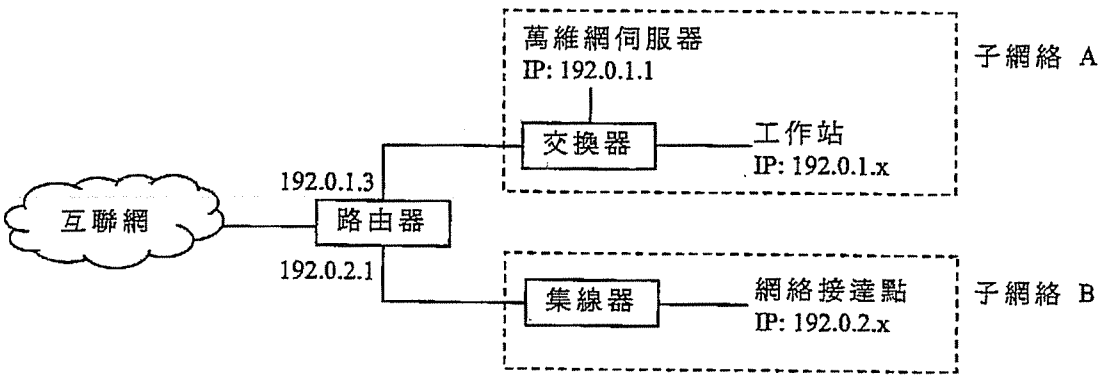
END OF PAPER

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

本試卷全部試題均須回答。

1. 小芬是一個網絡管理員，她在某博物館建立了一個網絡。這個網絡分爲兩個子網絡：子網絡 A 和子網絡 B。子網絡 A 包含一個萬維網伺服器和一些供員工使用的工作站。子網絡 B 包含一些供參觀人仕免費連接至互聯網的無線網絡接達點 (AP)。



(a) 這個網絡採用了哪種網絡布局？試指出這種布局的一個優點和一個缺點。

網絡布局：星形網絡布局 (1)

優點：其他設備損壞，也不會影响網絡的運作。 (1)

缺點：若中央設備損壞，整個網絡不能運作。 (1)

(3 分)

(b) 小芬希望以交換器取代子網絡 B 中的集線器。試指出交換器勝於集線器的**兩個**優點。

一、交換器有過濾表，能夠有效地傳送把資料傳送到目的地。 (1)

二、交換器勝於集線器是因為保安性較高。

(2 分)

(c) (i) 指出在子網絡 B 中使用 CSMA/CD 及 CSMA/CA 的設備。

CSMA/CD：網絡佈局

CSMA/CA：網絡接達點 (1)

(ii) 小芬發現當再多兩個設備連接到 AP 時，網絡輸貫量嚴重下降。爲什麼？

因為設備過多，導致網絡流量下降，互網絡輸貫量平重下降。

(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

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(d) 在子網絡 A，交換器的 IP 位址是 192.0.1.2，而工作站的 IP 位址範圍是從 192.0.1.4 至 192.0.1.21。

(i) 哪一類 IP 位址在使用中？ 動態IP地址

(ii) 試寫出其子網絡遮罩及預設通訊閘。

子網絡遮罩： _____ : 255.255.255.255

預設通訊閘： 192.0.10.3

(iii) 試建議一個方法，向子網絡 A 內的工作站分派 IP 位址，並指出這項建議的一個優點和一個缺點。

優點：可快捷地在一些情況下進行派發IP地址給網絡。

缺點：人手派發会出現重複的IP地址，導致網絡造成混亂。

(iv) 試從 IP 位址轉譯方面，解釋如何透過互聯網連接到子網絡 A 中的萬維網伺服器。

(7 分)

(e) 子網絡 A 的工作站要共用一個 USB 打印機。

(i) 試以步驟說明工作站之間可如何共用此台打印機。

工作站之間經一條主电纜線，然後把資料傳送到打印机的IP地址，在过程中，要经过交換器，才能共用此台打印机。

(ii) 試指出 (e)(i) 部分的打印機共用方法的一個缺點。

会發生數據衝突

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

2. 小明是一所中學的網絡管理員。

(a) 小明打算為以下每個問題找出一個解決方案：

P1： 因使用 USB 快閃記憶體而傳播電腦病毒
P2： 因意外刪除了伺服器內的檔案而丟失數據
P3： 因硬盤意外損毀而丟失數據
P4： 因意外切斷電力供應而對伺服器的影響

完成下表以顯示解決這些問題時所需的硬件／軟件，並簡略說明相關的解決方案。

	所需硬件／軟件	說明
P1	防毒軟件	防毒軟件可用來防止病毒經USB快閃記憶体而傳播的電腦病毒隔離。
P2		
P3	快閃記憶體	可以把資料進行備份
P4	後備電池	可以在危急的情況下，便能立刻開啟电力

（8 分）

(b) 一天，有些教師報告說，他們無法從學校的工作站連接到學校網站。

從下列各個情況，小明可推斷出什麼類別的硬件問題？

(i) 這些教師可以瀏覽互聯網上其他網頁。

學校的伺服器

(ii) 這些教師可以利用公用 IP 位址瀏覽學校的網頁。

路由器

(iii) 這些教師無法利用 IP 位址連接到互聯網上的網站，但他們可以接達學校所有網絡資源。

~~路由器無法正常運作~~ 網絡接達點

（3 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

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(c) 一位老師利用自己的手提電腦連接到學校的網絡，但他不能連接到互聯網和學校的網絡資源。試描述小明如何使用一些命令和／或實用程式來診斷和解決這個網絡問題。

（4 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

3. 李先生在一所中學建立了一個電腦網絡，他打算制訂下列限制：

R1： 禁止學生瀏覽具不雅資訊的網站。
R2： 禁止學生利用工作站與外來的電腦直接通訊。
R3： 禁止學生從互聯網以 FTP 下載檔案。
R4： 禁止學生在工作站安裝軟件。

(a) 李先生可以使用代理伺服器或防火牆來制訂 R1，這兩項設備分別採用內容過濾和數據包過濾。

(i) 此代理伺服器和防火牆是如何進行不同的過濾？

防火牆可制訂限制~~網頁瀏覽~~。瀏覽不雅資訊的网站。

代理伺服器可限制学生从互联网以FTP下載檔案。

(ii) 李先生考慮只使用此代理伺服器。試舉出一個優點及一個缺點。

優點：可以限制学生瀏覽不良网頁站。

缺點：不能把病毒隔離。

(4 分)

(b) 試描述李先生是如何管理此網絡來制訂下列限制。

(i) R2： ~~李先生可以把~~学生利用工作站与外来的电脑的資訊，把~~限制~~李先生可以把中央設備切斷。

(ii) R3： 李先生可使用代理伺服器，局限学生从互联网上以FTP下載檔案。

(iii) R4：

(6 分)

寫於邊界以外的答案，將不予評閱。

(c) 李先生需透過互聯網接達學校的網絡，使電腦維修保養工作更容易。因此，他需要建立一條安全的通道以傳輸數據。

(i) 試建議李先生一個可行的方法。

虛擬私人網絡 (1)

(ii) 試指出 (c)(i) 建議的兩個缺點。

價格昂貴 ✗

傳輸速度較低 (1)

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

4. 小美是一個網絡管理員，她正爲圖書館建立一個附有數個無線網絡接達點 (AP) 的無線網絡。這樣，讀者便可將自己的流動設備連接至互聯網。

(a) (i) 除手提電腦外，試舉出**兩種**可以連接到 AP 的流動設備。

手提电話和 桌上电脑

(ii) 在這些流動設備內，哪個硬件部件是連接互聯網的關鍵？

无線网絡接述器

(3 分)

小美設置了兩個無線局部區域網絡 LIB-Y5a 和 LIB-Y5b，並在圖書館內進行測試。她使用手提電腦檢測無線網絡後有以下結果：

SSID	強度
LIB-Y5a *無安全性的無線網絡*	+++++✧
PUB-Y5 *無安全性的無線網絡*	++✧✧✧✧
LIB-Y5b *啓用安全性的無線網絡*	+++++
HKEAA1 *啓用安全性的無線網絡*	+✧✧✧✧
eaa *啓用安全性的無線網絡*	+++✧✧✧

(b) (i) 所檢測到的無線網絡的服務設定識別碼 (Service Set Identifier, SSID) 是否必須是獨有的？試簡單解釋。

是。因为静识别码 能够的识别身份，如 全部一样的说，无法辨别是那无线网絡，因此是必须独有的。

(ii) 爲什麼會檢測到一些其他無線網絡？

因为在区域网络中检测出其他无線网絡。

(3 分)

1

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

小美建議兩種安全性較高的方法連接無線網絡，如下列圖 1 和圖 2 所示。

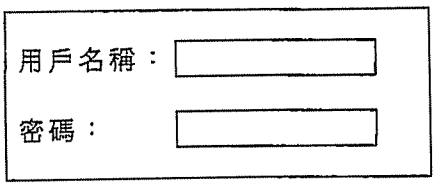


圖 1

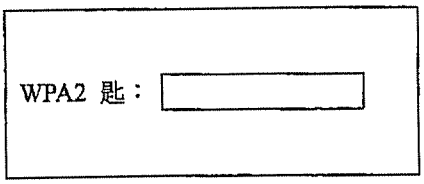


圖 2

(c) (i) 在下列每個方格內，若有關方法可於相關網絡採用，便填上「✓」，否則填上「x」。

	LIB-Y5a	LIB-Y5b
圖 1	✓	✓
圖 2	x	✓

(ii) 每個方法在維護網絡安全上的主要目的是什麼？

圖 1：為了

圖 2：

(iii) 圖 1 所示的方法是否需要額外的服務或硬件？如有，它是什麼？

是，需要[illegible]一些單性密碼

（5 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(d) 小強是一位讀者，他的電腦檢測到圖書館免費提供的無線網絡的 SSID。小強的朋友均能成功連接這個網絡，但他卻未能成功連線。試舉出**兩個**與網絡有關的可能原因。

(2 分)

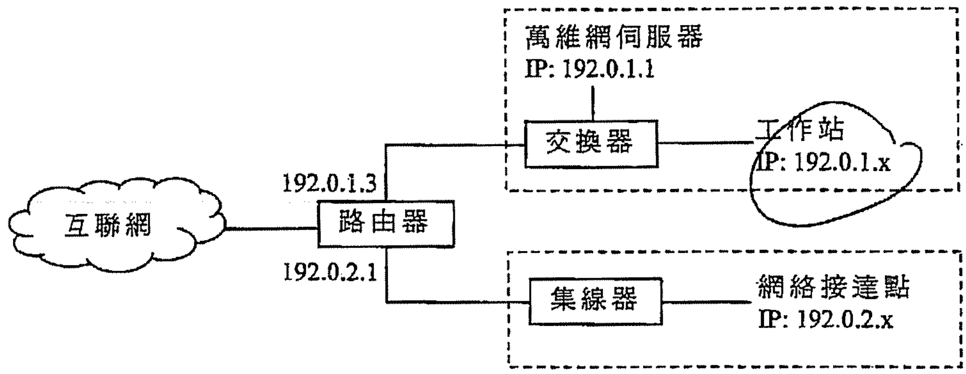
試卷完

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

本試卷全部試題均須回答。

1. 小芬是一個網絡管理員，她在某博物館建立了一個網絡。這個網絡分為兩個子網絡：子網絡 A 和子網絡 B。子網絡 A 包含一個萬維網伺服器和一些供員工使用的工作站。子網絡 B 包含一些供參觀人仕免費連接至互聯網的無線網絡接達點 (AP)。



(a) 這個網絡採用了哪種網絡布局？試指出這種布局的一個優點和一個缺點。

網絡布局：這網絡採用總線型布局

優點：各有各的工作站，不會影響到其他网絡。

缺點：當其中一個网絡或工作站壞了全個网絡會停。

（3 分）

(b) 小芬希望以交換器取代子網絡 B 中的集線器。試指出交換器勝於集線器的**兩個**優點。

減少數據衝突的可能。

交換器会將封包分別處理，減少被盜可能性。

（2 分）

(c) (i) 指出在子網絡 B 中使用 CSMA/CD 及 CSMA/CA 的設備。

CSMA/CD：

CSMA/CA：

(ii) 小芬發現當再多兩個設備連接到 AP 時，網絡輸貫量嚴重下降。為什麼？

因為网絡接達點前是集線器，多兩個設備後數據傳送就会增加。

（4 分）

寫於邊界以外的答案，將不予評閱。

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(d) 在子網絡 A，交換器的 IP 位址是 192.0.1.2，而工作站的 IP 位址範圍是從 192.0.1.4 至 192.0.1.21。

(i) 哪一類 IP 位址在使用中？ TCP

(ii) 試寫出其子網絡遮罩及預設通訊閘。

子網絡遮罩：

預設通訊閘：

(iii) 試建議一個方法，向子網絡 A 內的工作站分派 IP 位址，並指出這項建議的一個優點和一個缺點。

用使用 DHCP 伺服器，自子网络A自動分發IP位址。

優點：省每一次開机会自动分發IP

(iv) 試從 IP 位址轉譯方面，解釋如何透過互聯網連接到子網絡 A 中的萬維網伺服器。

先到 192.0.1.3 然後經交換器到 192.0.1.1 的萬維網伺服器。

(7 分)

(e) 子網絡 A 的工作站要共用一個 USB 打印機。

(i) 試以步驟說明工作站之間可如何共用此台打印機。

在路由器後加一台打印机。

(ii) 試指出 (e)(i) 部分的打印機共用方法的一個缺點。

只有子网里的工作站才可以使用

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

2. 小明是一所中學的網絡管理員。

(a) 小明打算爲以下每個問題找出一個解決方案：

P1： 因使用 USB 快閃記憶體而傳播電腦病毒
P2： 因意外刪除了伺服器內的檔案而丟失數據
P3： 因硬盤意外損毀而丟失數據
P4： 因意外切斷電力供應而對伺服器的影響

完成下表以顯示解決這些問題時所需的硬件／軟件，並簡略說明相關的解決方案。

	所需硬件／軟件	說明
P1	防毒軟件	為自攜USB快閃記憶體進行掃描，檢查到毒病後進行防殺
P2	to RAM	
P3		
P4		

（8 分）

(b) 一天，有些教師報告說，他們無法從學校的工作站連接到學校網站。

從下列各個情況，小明可推斷出什麼類別的硬件問題？交換器 集線器

(i) 這些教師可以瀏覽互聯網上其他網頁。

網頁伺服器 (1)

(ii) 這些教師可以利用公用 IP 位址瀏覽學校的網頁。

IP伺服器

(iii) 這些教師無法利用 IP 位址連接到互聯網上的網站，但他們可以接達學校所有網絡資源。

~~使用軟件~~ 防火牆伺服器

（3 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

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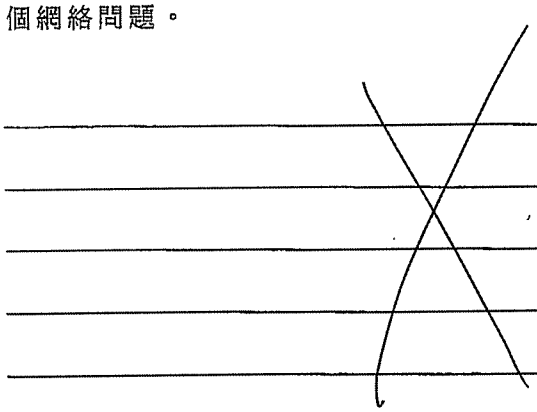
(c) 一位老師利用自己的手提電腦連接到學校的網絡，但他不能連接到互聯網和學校的網絡資源。試描述小明如何使用一些命令和／或實用程式來診斷和解決這個網絡問題。



（4 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

3. 李先生在一所中學建立了一個電腦網絡，他打算制訂下列限制：

R1： 禁止學生瀏覽具不雅資訊的網站。
R2： 禁止學生利用工作站與外來的電腦直接通訊。
R3： 禁止學生從互聯網以 FTP 下載檔案。
R4： 禁止學生在工作站安裝軟件。

(a) 李先生可以使用代理伺服器或防火牆來制訂 R1，這兩項設備分別採用內容過濾和數據包過濾。

(i) 此代理伺服器和防火牆是如何進行不同的過濾？

代理伺服器是監察和監管学生瀏覽网站。
而防火牆系来限制学生瀏覽网站

(ii) 李先生考慮只使用此代理伺服器。試舉出一個優點及一個缺點。

缺点：只有会根據網站

(4 分)

(b) 試描述李先生是如何管理此網絡來制訂下列限制。

(i) R2：

(ii) R3：設定使用者的下載數據，禁止学生在互聯网上下載檔案。

(iii) R4：安裝一個軟件，每次關機重新開机，就会回復基本設定

(6 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) 李先生需透過互聯網接達學校的網絡，使電腦維修保養工作更容易。因此，他需要建立一條安全的通道以傳輸數據。

(i) 試建議李先生一個可行的方法。

把數據進行加密

(ii) 試指出 (c)(i) 建議的**兩個**缺點。

不能隨時意把电腦使用權借給別人。

去有忘記密碼的可能性。

（3 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

4. 小美是一個網絡管理員，她正爲圖書館建立一個附有數個無線網絡接達點 (AP) 的無線網絡。這樣，讀者便可將自己的流動設備連接至互聯網。

(a) (i) 除手提電腦外，試舉出**兩種**可以連接到 AP 的流動設備。

掌上型电脑 ✗

擁有网络連接的智能手機 (1)

(ii) 在這些流動設備內，哪個硬件部件是連接互聯網的關鍵？

WLAN 為 ... 發 ... (AP) 給使用 ...

(3 分)

小美設置了兩個無線局部區域網絡 LIB-Y5a 和 LIB-Y5b，並在圖書館內進行測試。她使用手提電腦檢測無線網絡後有以下結果：

SSID	強度
LIB-Y5a ✓ *無安全性的無線網絡*	✦✦✦✦✦✧ ✓
PUB-Y5 *無安全性的無線網絡*	✦✦✧✧✧✧
LIB-Y5b ✓ *啓用安全性的無線網絡*	✦✦✦✦✦✦ ✓
HKEAA1 *啓用安全性的無線網絡*	✦✧✧✧✧✧
eaa *啓用安全性的無線網絡*	✦✦✦✧✧✧

(b) (i) 所檢測到的無線網絡的服務設定識別碼 (Service Set Identifier, SSID) 是否必須是獨有的？試簡單解釋。

不是，因為名字可重複，但 IP 不能 ✗

(ii) 爲什麼會檢測到一些其他無線網絡？

因為手提电腦的檢測範圍並不單單在圖書館內，所以会檢測到其他网絡 ✗

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

小美建議兩種安全性較高的方法連接無線網絡，如下列圖 1 和圖 2 所示。

圖 1	圖 2
用戶名稱：[ ] 密碼：[ ]	WPA2 匙：[ ]

(c) (i) 在下列每個方格內，若有關方法可於相關網絡採用，便填上「✓」，否則填上「✗」。

	LIB-Y5a	LIB-Y5b
圖 1	✗	✓
圖 2	✗	✓

(ii) 每個方法在維護網絡安全上的主要目的是什麼？

圖 1： ~~防止大過…~~ 只有管理人員使用

圖 2： 知道密碼就可使用，不用登入

(iii) 圖 1 所示的方法是否需要額外的服務或硬件？如有，它是什麼？

WIFI 接收網絡

（5 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(d) 小強是一位讀者，他的電腦檢測到圖書館免費提供的無線網絡的 SSID。小強的朋友均能成功連接這個網絡，但他卻未能成功連線。試舉出**兩個**與網絡有關的可能原因。

因為可設定要登入网頁後才可使用網絡即放棄。

又有可能 SSID 並不是圖書館提供。

（2 分）

試卷完

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

ICT 2C

Answer all questions.

1. Peter is the web designer of an online discussion forum. Members of the forum upload files to share with others, and most of the files are videos. He decides to set up a video-sharing web site for members to upload, share and view videos.

(a) (i) It is found that the extensions of the files uploaded by the members include:

avi, doc, flv, mov, mp3, mpg, pdf, php, rm, wmv

Which of these are video file types?

avi, flv, mov, mpg, rm, wmv. (2)

(ii) Suppose the web site supports all video formats. Give **two** advantages of this configuration.

- People can choose the file format they want, they don't need to change the video format when upload to the website. (1)
- People can upload the video via mobile, computer. (1)

(4 marks)

(b) Peter decides that all the videos uploaded should be converted to a standard format.

(i) Peter proposes that the videos should adopt the same video file format and have a low frame rate. Give **two** advantages of this proposal for web site development.

(1) Same video format required only one plug-in to play which save storage space. (1)

(2) low frame rate resulting a short download time of web site. (1)

(ii) Suggest **two** more attributes in which the videos can be standardised.

The resolution and bit rate of the videos. (2)

(4 marks)

Answers written in the margins will not be marked.

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Answers written in the margins will not be marked.

Please stick the barc ere.

(c) Peter considers the following two methods of sending videos to members.

Method 1: Send the entire video to members before they watch it.
Method 2: Send the videos to members and they can watch them instantaneously.

(i) Give **two** potential advantages of each method.

Method 1: Members can save the video and have further editon to the video after the dowloaded the entire video. Also, members can watch the video at any time. (1) (1)

Method 2: Members can watch the video during the download process and no need to wait until the whole file is downloaded. It saves the storage spaces of the members' computer. (1) (1)

(ii) Peter uses an embedded player in the design. Give **two** advantages of using the embedded player.

(1) No need for the user to install an extra software (1)
(2) Reduce the load of the client computer (1)

(6 marks)

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Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

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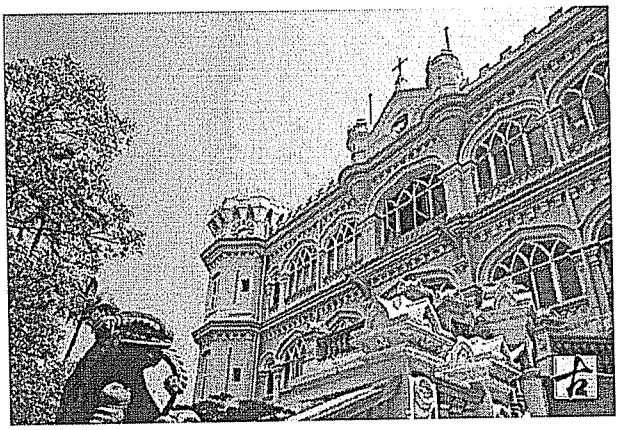
For example, if the image of 'University Hall, HKU' is clicked, the following page is shown:

Design 2B

香港大學大學堂
University Hall, HKU



University Hall, which is situated on top of a hill in Pokfulam, is a charming edifice in a blend of Tudor and Gothic architectural styles. It was built in about 1861 by a Scottish businessman, Douglas Lapraik, as his headquarters and residence and named "Douglas Castle" after him.

(a) Compare the two designs from the user's point of view. Give **three** differences between them. For each of them, give and justify your preference.

Firstly, users no need to see the descriptions they dont want to see in design 2, but in design 1, users have to see all the other description. I prefer design 2 as it takes shorter time to search the information I need. Secondly, users have to click into the photos to see more details in design 2 where it is no need in design 1. I prefer design 1 as it is more convenient Thirdly, larger photos can be seen in design 2. I prefer design 2 as users can see the photos more clearly when they click it.

(3 marks)

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Answers written in the margins will not be marked.

(b) Suggest a web page design method for aligning the information in the way shown in Design 2A.

Table ✓ (1)

(1 mark)

(c) In Design 2A, Amy shows the names of monuments as images.

(i) Give **two** disadvantages of showing English words in this way.

Users cannot find the words of the monuments by searching function. Also, users cannot copy the words. (2)

(ii) Give one advantage of showing Chinese characters in this way.

Users can also see the correct Chinese character even they use different language system. ✓ (1)

(3 marks)

(d) To reduce the download time of the images in Design 2A, Amy uses images with reduced file sizes. Suggest **three** ways in which Amy can reduce the file size of the images.

Amy can decrease the resolution for each image, or Amy can ~~Just Create~~ decrease the colour depth of the image Besides Amy can compress the image. ✓ (3)

(3 marks)

(e) Amy wants to show the images in Design 2A using interlacing. Give the main advantage of this technique.

Users can see the outline of the image before it finish downloading. ✓ (2)

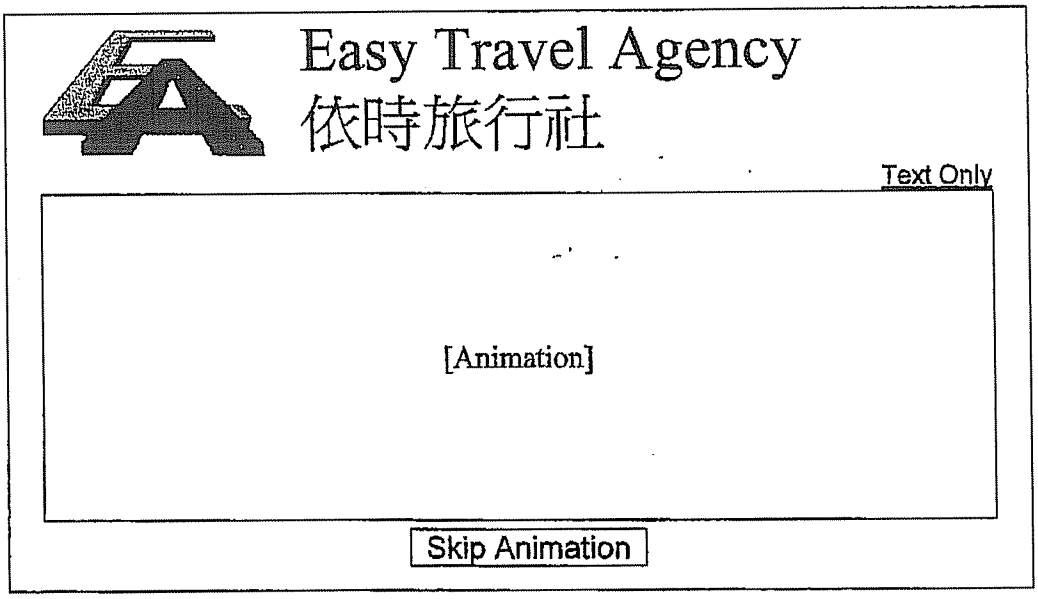
(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. Janice is a web designer. She is designing a web site for Easy Travel Agency. The first page of the web site is sketched below:



(a) Janice first draws the company logo using a vector graphics software package. Then, she exports the logo using the filename 'logo.gif' with a resolution of 50 × 30.

(i) Why does Janice need to export the logo in another format instead of using the logo in vector graphics format directly?

Because web browser cannot support ~~~~ showing vector graphics directly.

1

(ii) Give **two** reasons to explain why Janice wants to export the logo in GIF format instead of JPEG format.

① GIF support animations, Janice can make it as a ~~move~~ moving logo.

② She wants the background of the logo become transparent. JPEG is not supporting alpha layers.

2

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Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(iii) After inserting the logo into the web page, Janice feels that the web page will look much better if the resolution of the logo is 150 × 90. There are two ways to alter the resolution:

(1) Use the HTML code '<img src="logo.gif" width="150">'.
(2) Use the vector graphics software package again to export the logo with a resolution of 150 × 90.

Which method do you suggest? Explain briefly.

method 2, since enlarging a bitmap graphic may cause the Image to a quality degrade. By exporting the logo from the vector graphics software again, no quality of Images will be affected.

2

(5 marks)

(b) Give **two** reasons to explain why Janice would like to have a text only page in addition to the graphical page in her web site.

① Text only version has a faster loading speed which compares to the graphical page.

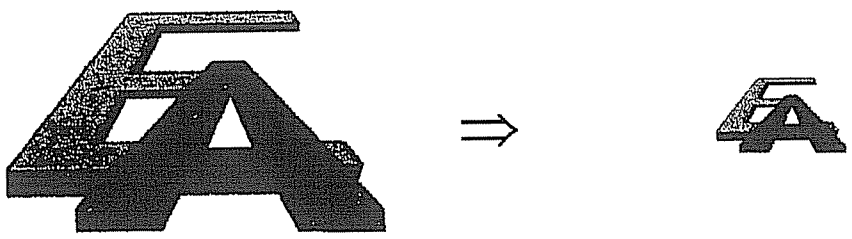
② Text only version can be converted to a dynamic screen for blinded people.

1

2

(2 marks)

(c) Janice wants to create an animation to zoom out so that the logo of the company appears smaller, as shown below.



(i) Write down the steps to take to create this animation.

① Set the bigger and smaller Image as two Key frame.
② set the time / second of per frames between to them
③ Apply the tween motion effect.

3

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Answers written in the margins will not be marked.

(ii) Janice wants to set the number of frames per second for the animation as either 10 or 30. Give advantage of each setting.

The animation will be smooth.

(iii) Janice exports the animation as SWF format. Give **two** advantages of including a button for skipping the animation.

① user can enter the website faster if he or she don't want to watch the animation.

② reduce the website downloading time.

(iv) Suggest and describe another button for the animation.

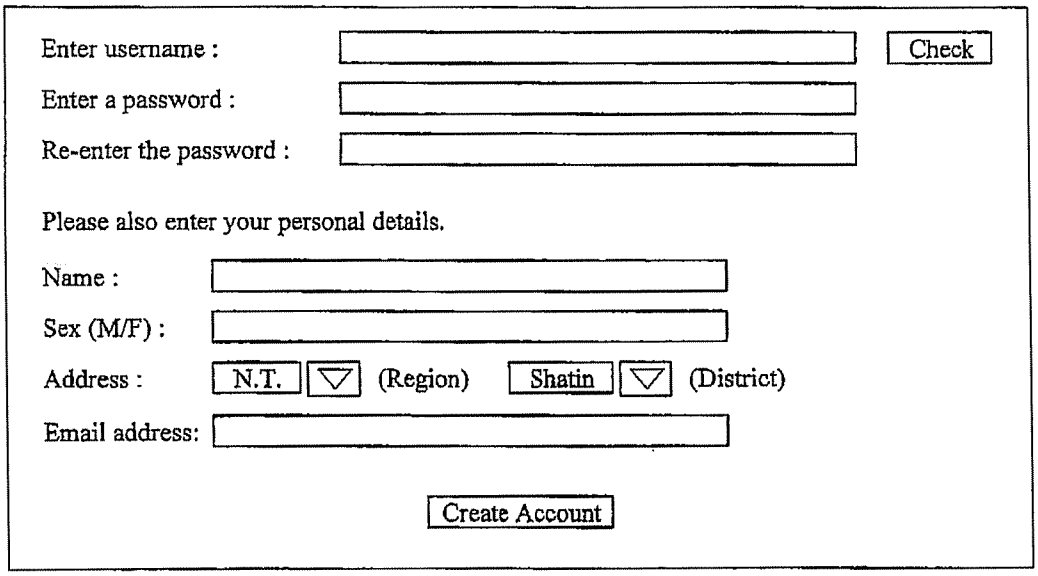
"Replay" button, for viewer to watch the animation again.

(8 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. John would like to set up a discussion forum for members to share their travel experiences. Before setting up the forum, he has to design a web page where users can sign up for new accounts, as shown below.



(a) Suggest **two** methods of entering the sex of the user, other than using a text box.

① radio button

② drop down menu

(2 marks)

Answers written in the margins will not be marked.

To sign up for a new account, users enter a unique username and type the password twice for confirmation. They can check whether the username has already been used by clicking the button 'Check'. All personal details have to be filled in.

(b) To validate the username and password, John suggests three methods below:

Method 1: plain HTML codes
Method 2: client side scripts
Method 3: server side scripts

(i) Suggest a method, 1, 2 or 3, of validating each of the following items. If more than one method is normally applicable, write down the one with the lowest number.

(1) The username consists of alphanumeric characters only. 2 ✓

(2) The maximum length of a username is 10. 1 ✓

(3) The minimum length of a password is 6. 1 ✗

(4) The two passwords are identical. 2 ✓

(5) The username has not been used. 3 ✓

(4)

(ii) If pop-up windows with error messages are to be automatically shown during the validation process, which method is applicable? Justify your answer.

Method 2, since the client side scripts can return the error message to the user until accepted ~~con~~ content only. (1) (1)

(7 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) After creating an account, users can log on to the discussion forum and post messages there.

(i) It is commonly said that the authentication process should be done on the server side due to security issues. Explain briefly why an authentication process done on the client side is insecure.

If the authentication process done on the client side, user may have a chance to change the information in the package and send it back to the server. It means that the important information of the system may change or damage by the user. It is insecure.

(ii) After logging on to the discussion forum, some authentication information about users, such as username, can be stored on the client side or server side.

(1) Where is the information stored on the client side? ~~cat~~ cookie (1)

(2) Give one advantage of storing such information on the client side.

user need not enter the username again when visiting the forum next time. (1)

(3) Describe how to transfer this authentication information across the web pages in the forum using hidden text in HTML.

It is encrypted messages.

When the authentication information is transferring, they are encrypted as hidden text and decrypted in server side.

(6 marks)

END OF PAPER

Sources of materials used in this paper will be acknowledged in the *Hong Kong Diploma of Secondary Education Examination Practice Papers* published by the Hong Kong Examinations and Assessment Authority at a later stage.

Answers written in the margins will not be marked.

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本試卷全部試題均須回答。

1. 家強是某網上討論區的網頁設計師。此討論區的會員上載檔案與他人分享，當中大部分檔案均是視像檔案。他決定設立一個視像檔案共享網站供會員上傳、分享和觀看。

(a) (i) 會員上載檔案的副檔名包括：

avi, doc, flv, mov, mp3, mpg, pdf, php, rm, wmv

它們哪些屬於視像檔案類型？

avi, wmv, mpg, flv, mov, rm ✓ (2)

(ii) 假設該網站支援所有視像格式，試舉出這項配置的**兩個**好處。

1. 會員可以不須進行更改視像格式，直接把檔案上存到網頁。✓ (2)

2. 可以保持視像原有的質素，不用為了採用相同的視頻檔案而更改格式，破壞其質素。

(4 分)

(b)

(i) 家強建議這些視像檔案應該採用相同的視頻檔案格式和一個低幀速率，試舉出這項建議對網站建構的**兩個**優點。

- 當用戶看視像時，不需要使用多個播放器 (1)，會較統一和用戶不需不斷下載相關的播放器

- 用戶觀看視像時，因低幀速率會變得順暢。✓ (1)

(ii) 試建議另外**兩個**可以標準化視像檔案的屬性。

色深和長寬比。✓ (2)

(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

請在此貼上電

(c) 家強考慮下列兩種方法給會員傳送視像檔案：

方法 1： 在會員觀看視像前，將整個檔案傳送給會員。
方法 2： 當傳送檔案給會員時，會員可即時觀看視像。

(i) 試就上述兩種方法，各舉**兩個**潛在的好處。

(整个檔案下載完能防止)

方法 1： 不像流式傳輸，中間因為傳送速度慢而停止播放和加以保留檔案，任何時間不用連線也可观看。 ✓ ✓ (2)

方法 2： 不用下載完，也可观看檔案和 [illegible] 當下載者在 [illegible] 認為深閱，可即時加以除，節省存貯空間。 ✓ ✓ (2)

(ii) 志強在此設計中使用嵌入式播放器。試舉出使用此嵌入式播放器的**兩個**好處。

1. 可在網頁內觀看視像 ✗
2. 不需要另外安裝播放器 ✓ (1)

(6 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

請在此貼上電

例如，若「香港大學大學堂」的圖像被點擊，將顯示以下頁面。

設計 2B

香港大學大學堂
University Hall, HKU

聳立於薄扶林一山頭上的大學堂是一座揉合了都鐸及哥德式建築風格的華麗建築。大學堂約於一八六一年由蘇格蘭商人杜格拉斯．林柏建成，作爲其公司總部及寓所之用，建築物亦因此命名爲杜格拉斯堡。

(a) 從使用者的角度，比較這兩種設計，寫出它們之間的**三項**差異。試就每項差異，列出及說明你的喜好。

首先，設計1把所有古蹟的說明均在同一頁中顯示，而設計2，在首頁顯示所有古蹟的圖像，點擊圖像後才顯示相关古蹟的說明。

第一，設計2是顯示所有圖片，設計1是圖片和說明，我認為設計2会比較好，因用戶可選擇自己喜愛的古蹟去看。(1) 第二，設計把所有資料在同一頁顯示，而設計2需圖像点擊後才顯示，我認為設計一會比較方便，因圖像与資料一齐，不需再浪費時間去等。(1)

第三，設計2点擊後的圖片会較大，但設計1又是很小(3分)的圖像，我会較喜歡設計2，因為会清楚一点看到古蹟圖像。(1)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(b) 建議一個網頁設計的方法，用以對齊如設計 2A 中所顯示的資訊。

運用表格. ✓ (1)

(1 分)

(c) 在設計 2A 時，小芬將古蹟的名字以圖像顯示。

(i) 試舉出以這種方式顯示英文字的**兩個**缺點。

1. 手提電腦搜尋不到圖像. ✓ (2)
2. 使用者不能複製文字.

(ii) 試舉出以這種方式顯示中文字的一個優點。

不需擔心瀏覽者的電腦中有否中文字的字型，使用圖像便令瀏覽者一定看到其中文字。(1)

(3 分)

(d) 爲了減少下載設計 2A 圖像的所需時間，小芬使用檔案較小的圖像。試建議**三種**方法讓小芬可縮減圖像的檔案大小。

減少圖像的色深. ✓
增加圖像的壓縮比
減少圖像的尺吋和像素 (3)

(3 分)

(e) 小芬想以交織式的方法顯示設計 2A 的圖像。試舉出這類格式的主要優點。

針對網絡速度較慢的用戶，不用下載圖像，便可以模糊的快一步顯示圖像，(完整)讓用戶快一步觀看圖像. ✓ (2)

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

3. 小麗是一名網頁設計師，她正爲依時旅行社設計一個網站。網站首頁的草稿如下所示：

(a) 小麗首先利用向量圖形軟件繪製公司的標誌。然後，她將此標誌以解像度 50 × 30 匯出至檔案 logo.gif。

(i) 爲什麼小麗要將標誌匯出至其他格式，而不直接使用向量圖形格式的標誌？

因為向量圖形的格式不能被大部分的圖像軟件開啟。

(ii) 試舉出**兩個**原因來說明爲什麼小麗要將標誌以 GIF 格式匯出，而非 JPEG 格式。

1. 因為JPEG格式每次都是有損壓縮，每次儲存也會有資訊流失。2. GIF格式可以製作透明底而JPEG格式不能。

乙

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(iii) 小麗將標誌加到網頁後，她認爲若標誌的解像度爲 150 × 90，網頁設計會更好。以下兩種方法均可改變其解像度。

(1) 利用 HTML 碼 <img src="logo.gif" width="150">。
(2) 再次利用向量圖形軟件將標誌以解像度 150 × 90 匯出。

你會建議哪種方法？試簡略解釋。

我會建議使用方法(2)，因為方法(1)會強行拉大原本較小的圖像，由此令圖像出現鋸齒。而方法(2)則能夠保持該標誌的原解像度。

(5 分)

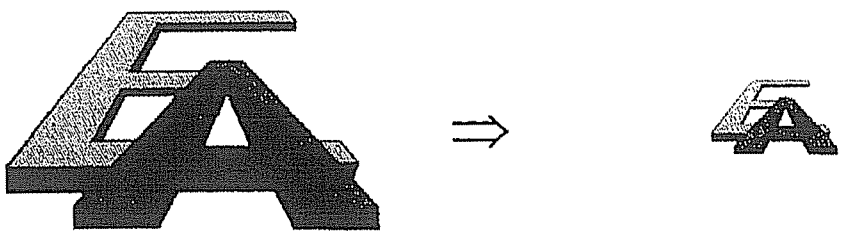
(b) 試舉出**兩個**理由來說明爲什麼小麗在此網站內有除了圖形化的網頁外，還希望有純文字網頁。

1.因為網頁可達性問題，要照顧視障人士。讀屏軟件無法辨認。

2.有用戶可能會使用手機上網，手機的顯示屏過細，不適合觀看。

(2 分)

(c) 小麗想製作一個動畫，將公司的標誌由大變小，如下圖所示。



(i) 試描述製作此動畫的步驟。

先繪畫標誌，然後在時間軸最後做位置點上相同但較小的標誌，加入特效的補間動畫。

(3)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(ii) 小麗希望設定每秒動畫的幀數爲 10 或 30。試舉出每項設定的一個好處

10 幀的動畫檔案容格式較細。

30 幀的動畫較流暢。

(iii) 小麗將動畫匯出至 SWF 格式。試舉出包含略過動畫按鈕的**兩個**好處。

1. 當使用者不想觀看動畫時，能夠透過該按鈕略過。

2. 使用者無需等候該動畫播放完畢才能進入網頁。

(iv) 試爲此動畫建議及描述另一個按鈕。

暫停按鈕。當使用者按下按鈕時動畫則會停止播放。

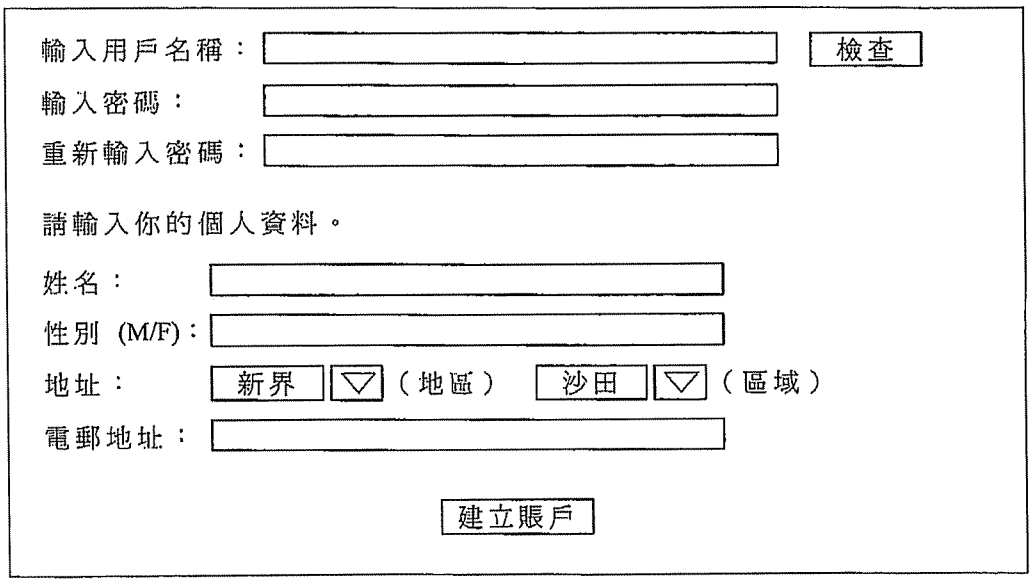
（8 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

4. 志偉打算建立一個討論區，讓會員分享旅遊體驗。在設立討論區前，他須設計一個網頁讓新用戶註冊，如下所示。



(a) 除使用文本框外，建議**兩個**方法來輸入用戶的性別。

下拉選項。表單按鈕。

（2 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

使用者要註冊一個新帳戶，需輸入一個獨有的用戶名稱，並輸入密碼兩次以作確認。他們可以點擊「檢查」按鈕以檢查用戶名稱是否已被使用。此外，所有個人資料必須填寫。

(b) 爲了驗證用戶名稱和密碼，志偉提出了下列三個方法：

方法 1：純 HTML 碼
方法 2：客戶端手稿程式
方法 3：伺服器端手稿程式

(i) 試建議方法 1、2 或 3 來驗證下列每個項目。如果多於一個適用的方法，填寫數值較小的一個。

(1) 用戶名稱由字母及數字字符所組成。 1 ✓

(2) 用戶名稱的最大長度爲 10。 2 ✓

(3) 密碼的最小長度爲 6。 2 ✓

(4) 兩個密碼是相同的。 2 ✓

(5) 用戶名稱尚未被使用。 3 ✓

3

(ii) 如在驗證過程中會自動顯示包含錯誤訊息的彈出視窗，哪個方法是適用呢？試加說明。

方法2。當驗證過程中出現錯誤，方法2最為合適，因為方法1不能選任，而方法3過於浪費頻寬，並加重了伺服器的負荷。 (3)

2

（7 分）

寫於邊界以外的答案，將不予評閱。

(c) 建立帳戶後，用戶可以登入討論區，從而發布信息。

(i) 基於保安理由，人們普遍認爲身分驗證過程應該在伺服器端進行。簡略解釋爲什麼在客戶端進行身分驗證過程並不安全。

因為在客戶端驗證時必須有應該資設儲存(在客戶端中)，所以他人很容易便可從客戶端偷到用戶的身份證資料。 2

(ii) 登入討論區後，一些用戶的認證資訊，例如用戶名稱，可以儲存在客戶端或伺服器端。

(1) 這類資訊儲存在客戶端的哪個地方？ 瀏覽器。

(2) 試舉出在客戶端儲存這類資訊的一個好處。

減低伺服器的頻寬負荷。 1

(3) 試描述如何在討論區的網頁之間利用 HTML 的隱藏文字傳遞這類認證資訊。

在網址的http前加上s，以表示使用密金加密的方式傳送資料。

（6 分）

試卷完

本試卷所引資料的來源，將於香港考試及評核局稍後出版的《香港中學文憑考試練習卷》內列明。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

Answer all questions.

1. Peter is the web designer of an online discussion forum. Members of the forum upload files to share with others, and most of the files are videos. He decides to set up a video-sharing web site for members to upload, share and view videos.

(a) (i) It is found that the extensions of the files uploaded by the members include:

avi, doc, flv, mov, mp3, mpg, pdf, php, rm, wmv

Which of these are video file types?

avi, flv, mov, rm, ✓ (1)

(ii) Suppose the web site supports all video formats. Give **two** advantages of this configuration.

The advantages of supporting all video format can convinent for the users no need the change the file format before uploading. Also, it can reduce the time cost. ✓ (1)

(4 marks)

(b) Peter decides that all the videos uploaded should be converted to a standard format.

(i) Peter proposes that the videos should adopt the same video file format and have a low frame rate. Give **two** advantages of this proposal for web site development.

the file is easier to organized ✗, the file size is smaller. ✓ (1)

(ii) Suggest **two** more attributes in which the videos can be standardised.

time and frame size. ✓ (1)

(4 marks)

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(c) Peter considers the following two methods of sending videos to members.

Method 1: Send the entire video to members before they watch it.
Method 2: Send the videos to members and they can watch them instantaneously.

(i) Give **two** potential advantages of each method.

Method 1: It the members get a slow speed of downloading video, they can watch the video ~~more smoothly~~ smoothly without stop the ~~vid~~ video and wait the steaming. (1)

Method 2: It can use less time to finish loading the ~~video~~ video and let the members enjoy the video faster than wait the video finish loading . (1)

(ii) Peter uses an embedded player in the design. Give **two** advantages of using the embedded player.

the video can be played in the web site directly. No additional video player is needed to download for watching the video. (1)

(6 marks)

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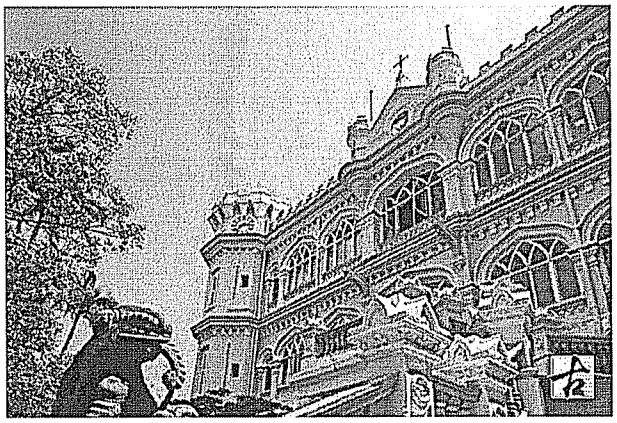
For example, if the image of 'University Hall, HKU' is clicked, the following page is shown:

Design 2B

香港大學大學堂
University Hall, HKU



University Hall, which is situated on top of a hill in Pokfulam, is a charming edifice in a blend of Tudor and Gothic architectural styles. It was built in about 1861 by a Scottish businessman, Douglas Lapraik, as his headquarters and residence and named "Douglas Castle" after him.

(a) Compare the two designs from the user's point of view. Give **three** differences between them. For each of them, give and justify your preference.

Design 1 can see all the ~~de~~ information and picture ~~is~~ in one page. Design 2 need to click in to the picture open ~~oter~~ other page. I prefer 1 because it take the user less working. Design 1 can only shown 2 picture in one page Design 2 can shown 6. I prefer 2 because it can shown more picture. Design 1 picture is small, Design 2 picture is big when it click the small picture. I prefer Design 2 because ~~it~~ ~~con~~ the image is clear.

(3 marks)

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Answers written in the margins will not be marked.

(b) Suggest a web page design method for aligning the information in the way shown in Design 2A.

using a table. ✓ (1)

(1 mark)

(c) In Design 2A, Amy shows the names of monuments as images.

(i) Give **two** disadvantages of showing English words in this way.

the ~~quantity~~ quality of the ~~images~~ might be lower when the screen resolution is high. ~~English words can not~~ it is hard to change the ~~size~~ colour or type of the English words. ✓ (1)

(ii) Give one advantage of showing Chinese characters in this way.

Some Chinese characters are not supported in some character encoding system. It can make sure the character can be shown. ✓ (1)

(3 marks)

(d) To reduce the download time of the images in Design 2A, Amy uses images with reduced file sizes. Suggest **three** ways in which Amy can reduce the file size of the images.

(1) Reduce the image resolution. ✓ (1)
(2) Reduce the colour depth of the image. ✓ (1)
(3) Transfer the image into JPEG ✗ format. ✓

(3 marks)

(e) Amy wants to show the images in Design 2A using interlacing. Give the main advantage of this technique.

It can show the picture immediately on the screen and reduce the downloading time. ✓ (1)

(2 marks)

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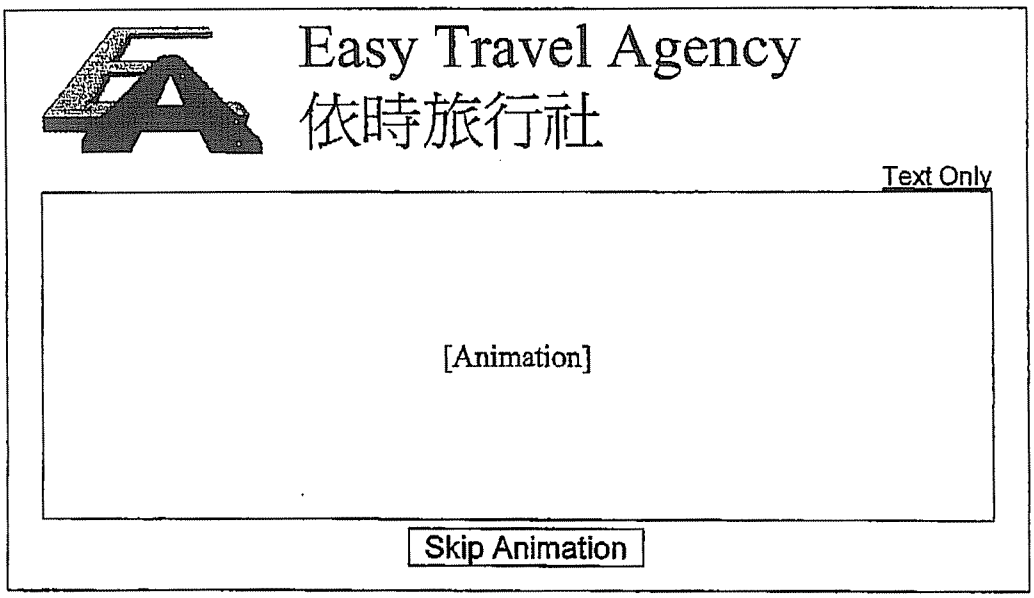
Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. Janice is a web designer. She is designing a web site for Easy Travel Agency. The first page of the web is sketched below:



(a) Janice first draws the company logo using a vector graphics software package. Then, she exports the logo using the filename 'logo.gif' with a resolution of 50 × 30.

(i) Why does Janice need to export the logo in another format instead of using the logo in vector graphics format directly?

It's because the browser does not support vector graphic so it cannot be shown normally on the screen.

(ii) Give **two** reasons to explain why Janice wants to export the logo in GIF format instead of JPEG format.

GIF support interlaced graphic while JPEG didn't. Part of the Logo can still be shown while the network is slow. Also, JPEG is not suitable for displaying the Character but GIF did. GIF gives a sharper view for the logo.

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Answers written in the margins will not be marked.

(iii) After inserting the logo into the web page, Janice feels that the web page will look much better if the resolution of the logo is 150 × 90. There are two ways to alter the resolution:

(1) Use the HTML code '<img src="logo.gif" width="150">'.
(2) Use the vector graphics software package again to export the logo with a resolution of 150 × 90.

Which method do you suggest? Explain briefly.

I suggest Method (1) since it can show the real scale of the photo so that it will not become out of expectation. Method (2) just enlarge the photo only.

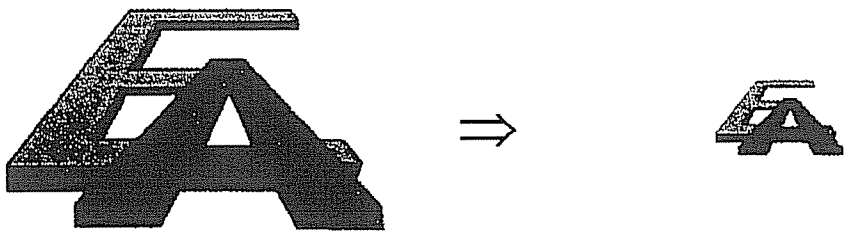
(5 marks)

(b) Give **two** reasons to explain why Janice would like to have a text only page in addition to the graphical page in her web site.

The text only page allow the person who is blind to access the site with screen reader. Also, the site can still be shown in text-only form when the browser is not able to display the graphic of the site.

(2 marks)

(c) Janice wants to create an animation to zoom out so that the logo of the company appears smaller, as shown below.



(i) Write down the steps to take to create this animation.

Janice can use the Flash software to develop an animation. The logo in larger size should be set as keyframe and use the smaller logo to be the end frame in the time line. Use the tweened animation to resize the logo. Finally, save the animation in GIF format.

3

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(ii) Janice wants to set the number of frames per second for the animation as either 10 or 30. Give advantage of each setting.

Janice can reduce the production time when setting the frames per second as 10. On the other hand, Janice can perform a more real process of resizing the image by setting it as 30.

(iii) Janice exports the animation as SWF format. Give **two** advantages of including a button for skipping the animation.

The user can skip the animation if they do not want to watch it. Also, user can skip the animation when they are in a hurry. 1

(iv) Suggest and describe another button for the animation.

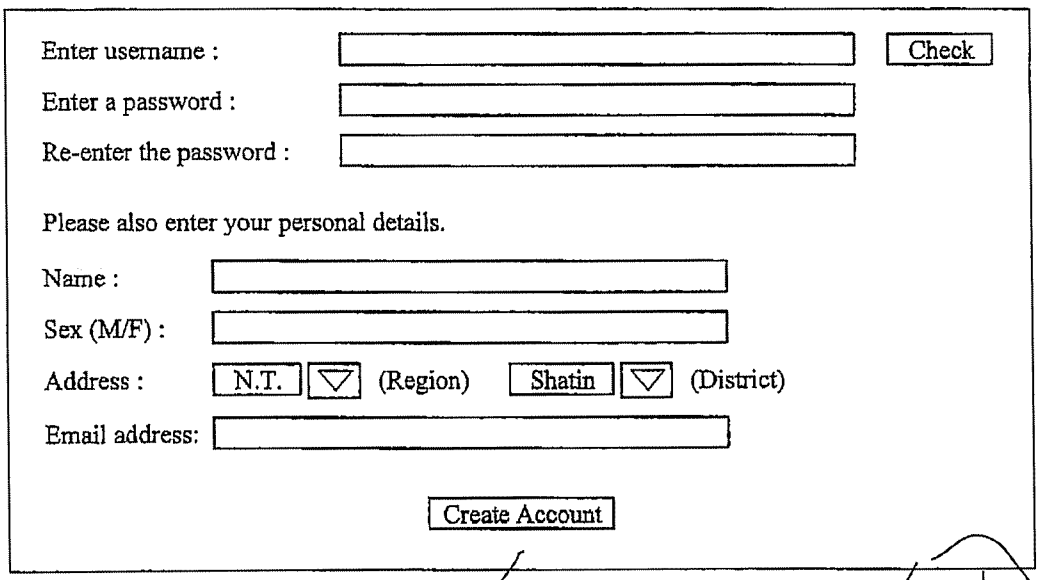
Janice can include the replay button so that the user can replay the animation if they want. 1

(8 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. John would like to set up a discussion forum for members to share their travel experiences. Before setting up the forum, he has to design a web page where users can sign up for new accounts, as shown below.



(a) Suggest **two** methods of entering the sex of the user, other than using a text box.

Using the radio box or the menu to enter the sex of the user.

(2 marks)

Answers written in the margins will not be marked.

To sign up for a new account, users enter a unique username and type the password twice for confirmation. They can check whether the username has already been used by clicking the button 'Check'. All personal details have to be filled in.

(b) To validate the username and password, John suggests three methods below:

Method 1: plain HTML codes
Method 2: client side scripts
Method 3: server side scripts

(i) Suggest a method, 1, 2 or 3, of validating each of the following items. If more than one method is normally applicable, write down the one with the lowest number.

(1) The username consists of alphanumeric characters only. 1

(2) The maximum length of a username is 10. 2

(3) The minimum length of a password is 6. 2

(4) The two passwords are identical. 2

(5) The username has not been used. 3

(ii) If pop-up windows with error messages are to be automatically shown during the validation process, which method is applicable? Justify your answer.

Method 2 is applicable. Since method 2 include programe like javascript and VBS script, it supports ~~show~~ pop-up ~~box~~ windows by typing the correct coding

(7 marks)

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Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) After creating an account, users can log on to the discussion forum and post messages there.

(i) It is commonly said that the authentication process should be done on the server side due to security issues. Explain briefly why an authentication process done on the client side is insecure.

All the information will be given to the user when using client-side scripting which means the username of other users will be sent to client as well. It is insecure for others since their information may be stolen because of this. - and other information

(ii) After logging on to the discussion forum, some authentication information about users, such as username, can be stored on the client side or server side.

(1) Where is the information stored on the client side? client side

(2) Give one advantage of storing such information on the client side.

It can reduce the serve storage capacity if they do not need to store the above information.

(3) Describe how to transfer this authentication information across the web pages in the forum using hidden text in HTML.

The above information will store inside the cookies and the information will be reload when the user enter a new web page.

(6 marks)

END OF PAPER

Sources of materials used in this paper will be acknowledged in the *Hong Kong Diploma of Secondary Education Examination Practice Papers* published by the Hong Kong Examinations and Assessment Authority at a later stage.

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Answers written in the margins will not be marked.

本試卷全部試題均須回答。

1. 家強是某網上討論區的網頁設計師。此討論區的會員上載檔案與他人分享，當中大部分檔案均是視像檔案。他決定設立一個視像檔案共享網站供會員上傳、分享和觀看。

(a) (i) 會員上載檔案的副檔名包括：

avi, doc, flv, mov, mp3, mpg, pdf, php, rm, wmv

它們哪些屬於視像檔案類型？

avi , flv , mov , wmv , ~~mpg~~ ✓ (1)

(ii) 假設該網站支援所有視像格式，試舉出這項配置的**兩個**好處。

1. 會員上載自視像前無須轉換視像格式，較為便利 ✓ (1)
2. 會員可根據視像格式尋找適合的 ✗ 視像

（4 分）

(b) 家強決定將所有已上載的視像檔案轉換成某類標準格式。

(i) 家強建議這些視像檔案應該採用相同的視頻檔案格式和一個低幀速率，試舉出這項建議對網站建構的**兩個**優點。

下載時間較短 ✓
方便修改格式 ✗ (1)

(ii) 試建議另外**兩個**可以標準化視像檔案的屬性。

解析度。視頻長度 ✗ (1)

（4 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

請在此貼上電

(c) 家強考慮下列兩種方法給會員傳送視像檔案：

方法 1：在會員觀看視像前，將整個檔案傳送給會員。
方法 2：當傳送檔案給會員時，會員可即時觀看視像。

(i) 試就上述兩種方法，各舉**兩個**潛在的好處。

方法 1：會員可保存視像於自己電腦內、避免出現停頓的現象 影片播放更為流暢. (2)

方法 2：節省等候下載的時間 不須等待整個視像完成下載就能播放視像 (1)

(ii) 志強在此設計中使用嵌入式播放器。試舉出使用此嵌入式播放器的**兩個**好處。

可以讓會員改變視像框的外觀X
可以避免非法下載該影片 (1)

(6 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

請在此貼上電

寫於邊界以外的答案，將不予評閱。

例如，若「香港大學大學堂」的圖像被點擊，將顯示以下頁面。

設計 2B

香港大學大學堂
University Hall, HKU

聳立於薄扶林一山頭上的大學堂是一座揉合了都鐸及哥德式建築風格的華麗建築。大學堂約於一八六一年由蘇格蘭商人杜格拉斯．林柏建成，作爲其公司總部及寓所之用，建築物亦因此命名爲杜格拉斯堡。

(a) 從使用者的角度，比較這兩種設計，寫出它們之間的**三項**差異。試就每項差異，列出及說明你的喜好。

第一，設計1是將古蹟所有的說明放置同一頁面，而設計2則按瀏覽者喜好選擇古蹟，自顯示該古蹟的說明頁面。我較喜歡設計2，因為不需拖至頁面底部才可知道最後一个的古蹟的說明。 (1)

第二，設計1的古蹟圖片較小，而設計2擁當頁中的圖片是預覽圖，点擊後会出現較大圖像。我較喜欢設計2，能更清楚看到有关古蹟的圖片。 (1)

第三，~~古蹟~~設計1的古蹟說明放在圖片的右边，需经常拖动左右軸來瀏覽，設計2就把圖片~~並~~和文字放在中央，使瀏覽者可閱讀全文，所以我喜欢設計2，在瀏覽更方便。

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(b) 建議一個網頁設計的方法，用以對齊如設計 2A 中所顯示的資訊。

用 DIV ×

（1 分）

(c) 在設計 2A 時，小芬將古蹟的名字以圖像顯示。

(i) 試舉出以這種方式顯示英文字的**兩個**缺點。

圖像載入時間長 ✓

瀏覽者不能複製，以獲取更多資訊有关 ✗ 到搜尋器

(1)

(ii) 試舉出以這種方式顯示中文字的一個優點。

第一，難以被 蜘蛛搜尋器（網絡）搜尋 ✓ (1)

（3 分）

(d) 爲了減少下載設計 2A 圖像的所需時間，小芬使用檔案較小的圖像。試建議**三種**方法讓小芬可縮減圖像的檔案大小。

降低解像度 ✓

降低色深 ✓

~~剪去不必要的部分~~

把圖片壓縮成 jpg 格的圖格式

(2)

（3 分）

(e) 小芬想以交織式的方法顯示設計 2A 的圖像。試舉出這類格式的主要優點。

可令瀏覽者以較短時間下載圖像。

能以較快時間上載圖像 ✗

(1)

（2 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

3. 小麗是一名網頁設計師，她正爲依時旅行社設計一個網站。網站首頁的草稿如下示：

(a) 小麗首先利用向量圖形軟件繪製公司的標誌。然後，她將此標誌以解像度 50 × 30 匯出至檔案 logo.gif。

(i) 爲什麼小麗要將標誌匯出至其他格式，而不直接使用向量圖形格式的標誌？

~~因為~~ 向量圖格式載入時間較長

(ii) 試舉出**兩個**原因來說明爲什麼小麗要將標誌以 GIF 格式匯出，而非 JPEG 格式。

JPEG為有損耗壓縮的格式，不能更改錯誤會令圖片失真

GIF可進行一格多圖編轉，方便日後更改圖形

1

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(iii) 小麗將標誌加到網頁後，她認為若標誌的解像度為 150 × 90，網頁設計會更好。以下兩種方法均可改變其解像度。

(1) 利用 HTML 碼 `<img src="logo.gif" width="150">`。
(2) 再次利用向量圖形軟件將標誌以解像度 150 × 90 匯出。

你會建議哪種方法？試簡略解釋。

(2)，因為向量圖形軟件不會令圖片失真，它會重新計算圖形的解像式。 (2)

(5 分)

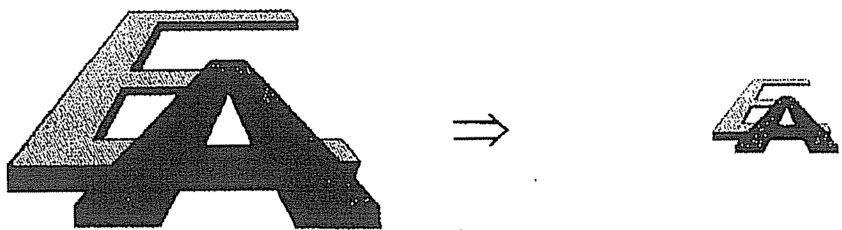
(b) 試舉出**兩個**理由來說明為什麼小麗在此網站內有除了圖形化的網頁外，還希望有純文字網頁。

~~為用户提供列印服務~~

適合弱視人仕的"文字選讀軟件"運行 (1)

(2 分)

(c) 小麗想製作一個動畫，將公司的標誌由大變小，如下圖所示。



(i) 試描述製作此動畫的步驟。

利用動畫製作軟件(例如flash)把一大一小的圖形匯入，在不同的時間分別插入兩幅圖片，再在圖片間建立補間，匯出成動畫 (3)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(ii) 小麗希望設定每秒動畫的幀數爲 10 或 30。試舉出每項設定的一個好處。

10 減低網絡流量，令動畫更快可以播放

30，令動畫更流暢

2

(iii) 小麗將動畫匯出至 SWF 格式。試舉出包含略過動畫按鈕的**兩個**好處。

方便給用戶不想看動畫

方便一些弱視人仕 ~~影片對~~ 他們更有宣傳效果

1

(iv) 試爲此動畫建議及描述另一個按鈕。

~~音量控制，避免動畫開始時~~

播放及暫停 避免動畫自動播放

(8 分)

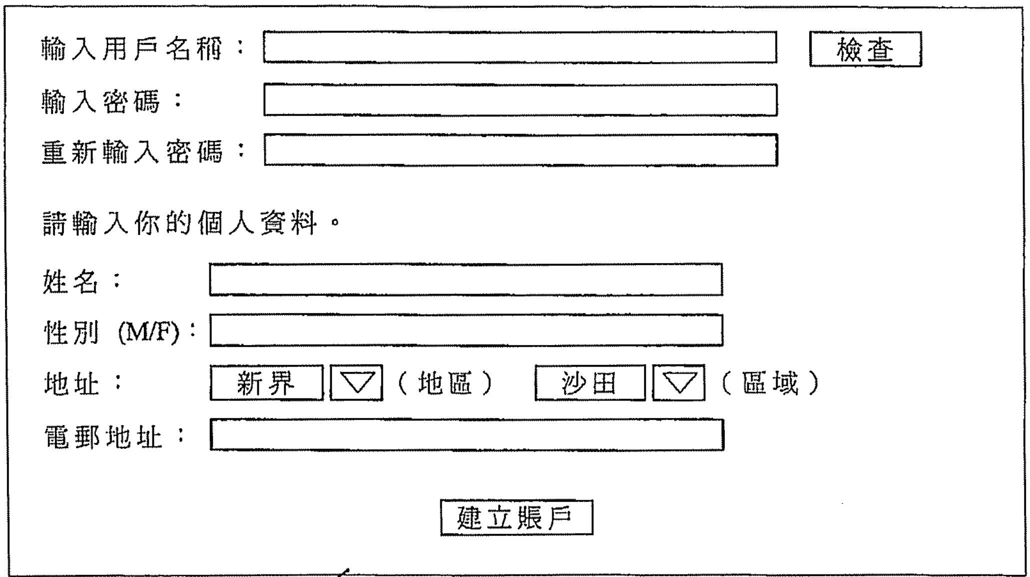
1

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

4. 志偉打算建立一個討論區，讓會員分享旅遊體驗。在設立討論區前，他須設計一個網頁讓新用戶註冊，如下所示。



(a) 除使用文本框外，建議**兩個**方法來輸入用戶的性別。

下拉式表單，選項鈕

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

使用者要註冊一個新帳戶，需輸入一個獨有的用戶名稱，並輸入密碼兩次以作確認。他們可以點擊「檢查」按鈕以檢查用戶名稱是否已被使用。此外，所有個人資料必須填寫。

(b) 爲了驗證用戶名稱和密碼，志偉提出了下列三個方法：

方法 1：純 HTML 碼
方法 2：客戶端手稿程式
方法 3：伺服器端手稿程式

(i) 試建議方法 1、2 或 3 來驗證下列每個項目。如果多於一個適用的方法，填寫數值較小的一個。

(1) 用戶名稱由字母及數字字符所組成。 1
(2) 用戶名稱的最大長度爲 10。 2
(3) 密碼的最小長度爲 6。 2
(4) 兩個密碼是相同的。 2
(5) 用戶名稱尚未被使用。 3

(ii) 如在驗證過程中會自動顯示包含錯誤訊息的彈出視窗，哪個方法是適用呢？試加說明。

2，因為手稿能在[illegible]後判斷資料後並作出其他指令／程序

（7 分）

寫於邊界以外的答案，將不予評閱。

(c) 建立帳戶後，用戶可以登入討論區，從而發布信息。

(i) 基於保安理由，人們普遍認爲身分驗證過程應該在伺服器端進行。簡略解釋爲什麼在客戶端進行身分驗證過程並不安全。

不能驗証一些核對資料的对錯，
例如身份証号码

(ii) 登入討論區後，一些用戶的認證資訊，例如用戶名稱，可以儲存在客戶端或伺服器端。

(1) 這類資訊儲存在客戶端的哪個地方？ 数據庫

(2) 試舉出在客戶端儲存這類資訊的一個好處。

下次登入时系统会记住登入用户的名称.

(3) 試描述如何在討論區的網頁之間利用 HTML 的隱藏文字傳遞這類認證資訊。

把認証資讯放在一些常用的按钮内，例如登入登出.

（6 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

試卷完

本試卷所引資料的來源，將於香港考試及評核局稍後出版的《香港中學文憑考試練習卷》內列明。

寫於邊界以外的答案，將不予評閱。

Answer all questions.

1. Peter is the web designer of an online discussion forum. Members of the forum upload files to share with others, and most of the files are videos. He decides to set up a video-sharing web site for members to upload, share and view videos.

(a) (i) It is found that the extensions of the files uploaded by the members include:

avi, doc, flv, mov, mp3, mpg, pdf, php, rm, wmv

Which of these are video file types?

avi, flv, mov, mpg, wmv (1)

(ii) Suppose the web site supports all video formats. Give **two** advantages of this configuration.

(1) no error occur when playing the video due to the inappropriate video file format.

(2) the video which is going to be uploaded do not need to be converted to a format, it is standard, more convenience. (1)

(4 marks)

(b) Peter decides that all the videos uploaded should be converted to a standard format.

(i) Peter proposes that the videos should adopt the same video file format and have a low frame rate. Give **two** advantages of this proposal for web site development.

The advantages are that the file size will be smaller as the frame rate is low also the server of the web site only need to install one plug in as there is only one kind of video format.

(ii) Suggest **two** more attributes in which the videos can be standardised.

The ~~Resolution~~ resolution and duration of the videos (1)

(4 marks)

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Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barc ere.

(c) Peter considers the following two methods of sending videos to members.

Method 1: Send the entire video to members before they watch it.
Method 2: Send the videos to members and they can watch them instantaneously.

(i) Give **two** potential advantages of each method.

Method 1: members can keep the video for a record (1)
the file size of the video is smaller. ~~so~~ X

Method 2: members can ~~be~~ watch ~~the~~ the home video
~~anyth~~ anyti X member can share the ~~video~~ video X to
friends.

(ii) Peter uses an embedded player in the design. Give **two** advantages of using the embedded player.

~~the users can~~ Peter can set the out-look of
player.
convenient for users, reduce X time to open video player

(6 marks)

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Answers written in the margins will not be marked.

Please stick the barc ere.

For example, if the image of 'University Hall, HKU' is clicked, the following page is shown:

Design 2B

香港大學大學堂
University Hall, HKU

University Hall, which is situated on top of a hill in Pokfulam, is a charming edifice in a blend of Tudor and Gothic architectural styles. It was built in about 1861 by a Scottish businessman, Douglas Lapraik, as his headquarters and residence and named "Douglas Castle" after him.

(a) Compare the two designs from the user's point of view. Give **three** differences between them. For each of them, give and justify your preference.

(1) All the information is shown ~~in~~ one page in design 1, but not in design 2.

(2) A ~~bigger~~ bigger size of image can be shown in design 2 (2B) but not in design 1.

(3) It takes more time to load the page in design 2 because it contains more images.

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) Suggest a web page design method for aligning the information in the way shown in Design 2A.

Justified X

(1 mark)

(c) In Design 2A, Amy shows the names of monuments as images.

(i) Give **two** disadvantages of showing English words in this way.

It is unclear to show English words in this way. Others may not know the name of the monuments very clear and may be confused. Also, the website may not able to support such a large storage capacity of objects and this could reduce the accessing time of the site. 1

(ii) Give one advantage of showing Chinese characters in this way.

Advantage of showing Chinese characters can let people ~~know~~ who don't know English know the name of monuments.

(3 marks)

(d) To reduce the download time of the images in Design 2A, Amy uses images with reduced file sizes. Suggest **three** ways in which Amy can reduce the file size of the images.

changing the file format ✓
reduce colour depth ✓
reduce resolution ✓ 2

(3 marks)

(e) Amy wants to show the images in Design 2A using interlacing. Give the main advantage of this technique.

People can see the images before it finished load the image. ✓ 1

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. Janice is a web designer. She is designing a web site for Easy Travel Agency. The first page of the web site is sketched below:

(a) Janice first draws the company logo using a vector graphics software package. Then, she exports the logo using the filename 'logo.gif' with a resolution of 50 × 30.

(i) Why does Janice need to export the logo in another format instead of using the logo in vector graphics format directly?

It is because ~~some of~~ the browsers may not support the vector graphics format.

(ii) Give **two** reasons to explain why Janice wants to export the logo in GIF format instead of JPEG format.

It is because the file size of GIF is smaller than JPEG format.

Also, the quality of GIF format is better than JPEG format.

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Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(iii) After inserting the logo into the web page, Janice feels that the web page will look much better if the resolution of the logo is 150 × 90. There are two ways to alter the resolution:

(1) Use the HTML code '<img src="logo.gif" width="150">'.
(2) Use the vector graphics software package again to export the logo with a resolution of 150 × 90.

Which method do you suggest? Explain briefly.

I will suggest method 2. It is because using vector graphics software to resize the logo, the quality of logo will still be the same as before.

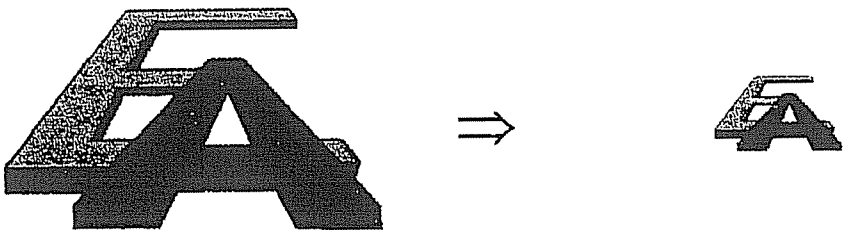
(5 marks)

(b) Give **two** reasons to explain why Janice would like to have a text only page in addition to the graphical page in her web site.

A text only page will be loaded faster than the graphical page.
Also, the users can read the text only page easily instead of reading graphical page by using mobile phone.

(2 marks)

(c) Janice wants to create an animation to zoom out so that the logo of the company appears smaller, as shown below.



(i) Write down the steps to take to create this animation.

First, we create a big size image and a small size image.
Second, we use the flash creator software to company two images.
Finally, we can output the animation.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(ii) Janice wants to set the number of frames per second for the animation as either 10 or 30. Give a advantage of each setting.

If she set as 10 frames per second, the ~~users~~ can see the frame clearly.

If she set as 30 frames per spond, there can be more full and interesting.

(iii) Janice exports the animation as SWF format. Give **two** advantages ~~of~~ including a button for skipping the animation.

It can save time. It is because SWF format need time to load.

It is user-friendly. Some people may not want to see the animation.

(iv) Suggest and describe another button for the animation.

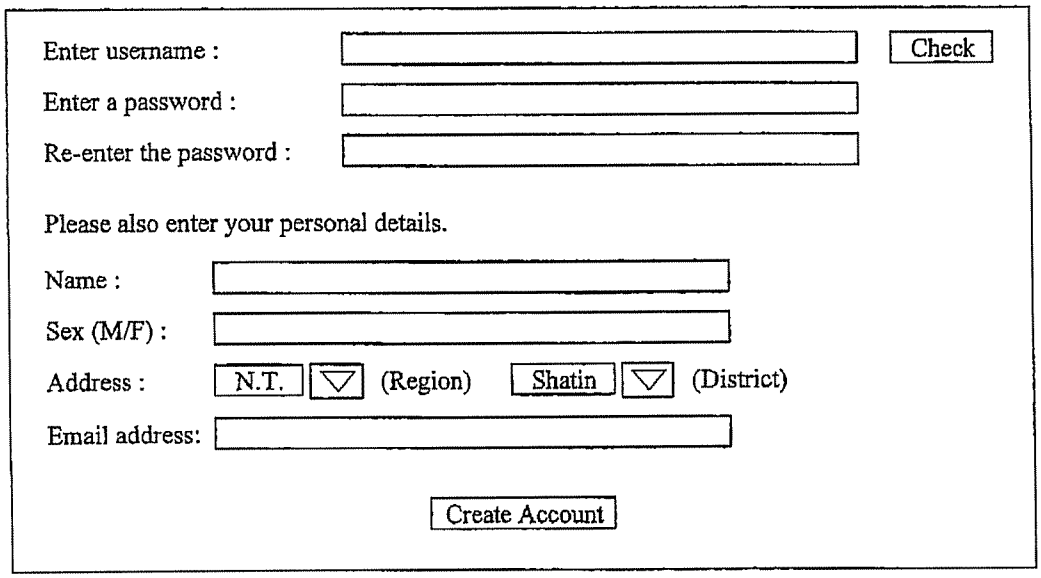
There can includ a stop button for the animation. Some people may want to see the animation clearly.

(8 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. John would like to set up a discussion forum for members to share their travel experiences. Before setting up the forum, he has to design a web page where users can sign up for new accounts, as shown below.



(a) Suggest **two** methods of entering the sex of the user, other than using a text box.

Use the checkbox to tick the sex.

Use the radio box to choose the sex.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

To sign up for a new account, users enter a unique username and type the password twice for confirmation. They can check whether the username has already been used by clicking the button 'Check'. All personal details have to be filled in.

(b) To validate the username and password, John suggests three methods below:

Method 1: plain HTML codes
Method 2: client side scripts
Method 3: server side scripts

(i) Suggest a method, 1, 2 or 3, of validating each of the following items. If more than one method is normally applicable, write down the one with the lowest number.

(1) The username consists of alphanumeric characters only. 3 X

(2) The maximum length of a username is 10. 1 ✓

(3) The minimum length of a password is 6. 1 X

(4) The two passwords are identical. 3 X

(5) The username has not been used. 2 X

1

(ii) If pop-up windows with error messages are to be automatically shown during the validation process, which method is applicable? Justify your answer.

Method 3. ✓

~~It is not~~ Users may use over time to sign up for a new account.

(7 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) After creating an account, users can log on to the discussion forum and post messages there.

(i) It is commonly said that the authentication process should be done on the server side due to security issues. Explain briefly why an authentication process done on the client side is insecure.

It is because server side is organize the website on the Internet, So, the authentication process should be done on the server side, The client side can do the basic personal security, such as password.

(ii) After logging on to the discussion forum, some authentication information about users, such as username, can be stored on the client side or server side.

(1) Where is the information stored on the client side? cookies (1)

(2) Give one advantage of storing such information on the client side.

These information is personal, It is better to store on the client side. It can protect the right of client side.

(3) Describe how to transfer this authentication information across the web pages in the forum using hidden text in HTML.

It can set the type as "password", so that the information will appear as hidden text.

(6 marks)

END OF PAPER

Sources of materials used in this paper will be acknowledged in the *Hong Kong Diploma of Secondary Education Examination Practice Papers* published by the Hong Kong Examinations and Assessment Authority at a later stage.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

本試卷全部試題均須回答。

1. 家強是某網上討論區的網頁設計師。此討論區的會員上載檔案與他人分享，當中大部分檔案均是視像檔案。他決定設立一個視像檔案共享網站供會員上傳、分享和觀看。

(a) (i) 會員上載檔案的副檔名包括：

avi, doc, flv, mov, mp3, mpg, pdf, php, rm, wmv

它們哪些屬於視像檔案類型？

avi, flv, rm, wmv ✓ ①

(ii) 假設該網站支援所有視像格式，試舉出這項配置的**兩個**好處。

方便觀看和省卻下載外掛程序。 ✗

（4 分）

(b) 家強決定將所有已上載的視像檔案轉換成某類標準格式。

(i) 家強建議這些視像檔案應該採用相同的視頻檔案格式和一個低幀速率，試舉出這項建議對網站建構的**兩個**優點。

1. 使網站載入內容時，速度更快 ①
2. 採用相同格式使整合資料時會更整齊統一。 ✗

(ii) 試建議另外**兩個**可以標準化視像檔案的屬性。

每年修改格式 ✓ ✗ ①

（4 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

請在此貼上電

(c) 家強考慮下列兩種方法給會員傳送視像檔案：

方法 1：在會員觀看視像前，將整個檔案傳送給會員。
方法 2：當傳送檔案給會員時，會員可即時觀看視像。

(i) 試就上述兩種方法，各舉**兩個**潛在的好處。

方法 1：能夠確保每一個会員都擁有該視像檔案，因此，能夠減低視像檔案遺失。

方法 2：能由在傳送檔案的過程中欣賞視像，因此能夠減少在傳送過程中浪費的時間 (1)

(ii) 志強在此設計中使用嵌入式播放器。試舉出使用此嵌入式播放器的**兩個**好處。

- 可以不用下載便可收看
- 節省傳送時間

(6 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

請在此貼上電

例如，若「香港大學大學堂」的圖像被點擊，將顯示以下頁面。

設計 2B

香港大學大學堂
University Hall, HKU

聳立於薄扶林一山頭上的大學堂是一座揉合了都鐸及哥德式建築風格的華麗建築。大學堂約於一八六一年由蘇格蘭商人杜格拉斯·林柏建成，作爲其公司總部及寓所之用，建築物亦因此命名爲杜格拉斯堡。

(a) 從使用者的角度，比較這兩種設計，寫出它們之間的**三項**差異。試就每項差異，列出及說明你的喜好。

設計一中，小芬把所以古蹟資料放在同一頁面中顯示；而設計二則把古蹟資料分开數頁。設計一中，加了資料文字說明於圖的右边，設計二中；按下相关图片，才会出現介紹。設計一中，圖放頁左，而文字放頁右；設計二圖放中央，下放文字。我較喜欢設計二。因為設計一最多缺点編排，太多資料歸於一頁，找資料十分麻煩。相反設計二較有排列，不用像設計一般麻煩查找。設計二較為清楚，因圖下有一段文字，較為簡潔。

(1)

(3 分)

寫於邊界以外的答案，將不予評閱。

(b) 建議一個網頁設計的方法，用以對齊如設計 2A 中所顯示的資訊。

表格 /①

(1 分)

(c) 在設計 2A 時，小芬將古蹟的名字以圖像顯示。

(i) 試舉出以這種方式顯示英文字的兩個缺點。

瀏覽者未必知道圖像就是連結和下載時間較長。①

(ii) 試舉出以這種方式顯示中文字的一個優點。

吸引瀏覽者注意

(3 分)

(d) 爲了減少下載設計 2A 圖像的所需時間，小芬使用檔案較小的圖像。試建議**三種**方法讓小芬可縮減圖像的檔案大小。

減少色深；用表格分开图片，然後再組合；圖檔檔案；使用PNG格式 ①

(3 分)

(e) 小芬想以交織式的方法顯示設計 2A 的圖像。試舉出這類格式的主要優點。

這樣能夠更吸引用户，因爲這類格式会讓網頁較为生动有趣的。

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

3. 小麗是一名網頁設計師，她正爲依時旅行社設計一個網站。網站首頁的草稿如下所示：

(a) 小麗首先利用向量圖形軟件繪製公司的標誌。然後，她將此標誌以解像度 50 × 30 匯出至檔案 logo.gif。

(i) 爲什麼小麗要將標誌匯出至其他格式，而不直接使用向量圖形格式的標誌？

向量圖形格式較大，不適合在網站標誌

(ii) 試舉出**兩個**原因來說明爲什麼小麗要將標誌以 GIF 格式匯出，而非 JPEG 格式。

① GIF格式是無損耗壓縮，而JPEG格式是有損耗壓縮

② GIF格式色深支援8位元，而且標誌不需太多色。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(iii) 小麗將標誌加到網頁後，她認爲若標誌的解像度爲 150 × 90，網頁設計會更好。以下兩種方法均可改變其解像度。

(1) 利用 HTML 碼 <img src="logo.gif" width="150">。
(2) 再次利用向量圖形軟件將標誌以解像度 150 × 90 匯出。

你會建議哪種方法？試簡略解釋。

建議方法2，因為向量圖形軟件的解像度較高好，而且不用在HTML碼中輸入大小。

(1)

(5 分)

(b) 試舉出**兩個**理由來說明爲什麼小麗在此網站內有除了圖形化的網頁外，還希望有純文字網頁。

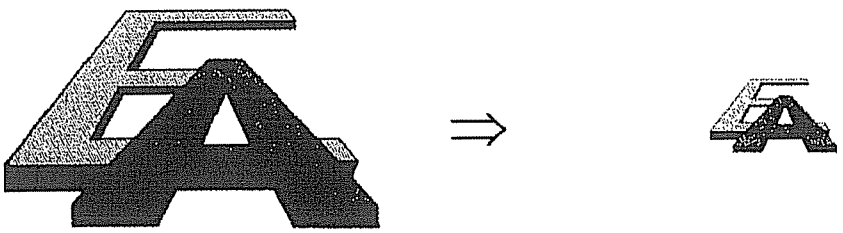
① 因為頻寬低的人下載圖形化的網頁較慢，所以有純文字網頁。

② 電子產品無網速慢，而且有圖象形及文字選擇方便有需要人士。

(2)

(2 分)

(c) 小麗想製作一個動畫，將公司的標誌由大變小，如下圖所示。



(i) 試描述製作此動畫的步驟。

步驟一：開啟 Flash 軟件
步驟二：然後第一格設定為關鍵影格
步驟三：開啟公司的標誌在第一格中
步驟四：第十格按下來為動影格
步驟五：將圖縮細
步驟六：測試，儲存和完成

(2)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(ii) 小麗希望設定每秒動畫的幀數爲 10 或 30。試舉出每項設定的一個好處。

幀數10可以更快完，簡潔！
幀數30可以讓人了解清楚 ✓

(iii) 小麗將動畫匯出至 SWF 格式。試舉出包含略過動畫按鈕的兩個好處。

① 直接使用該站，不用看完才能使用 ✓1

② ? ✗

(iv) 試爲此動畫建議及描述另一個按鈕。

另一個按鈕是暫停 ✓1

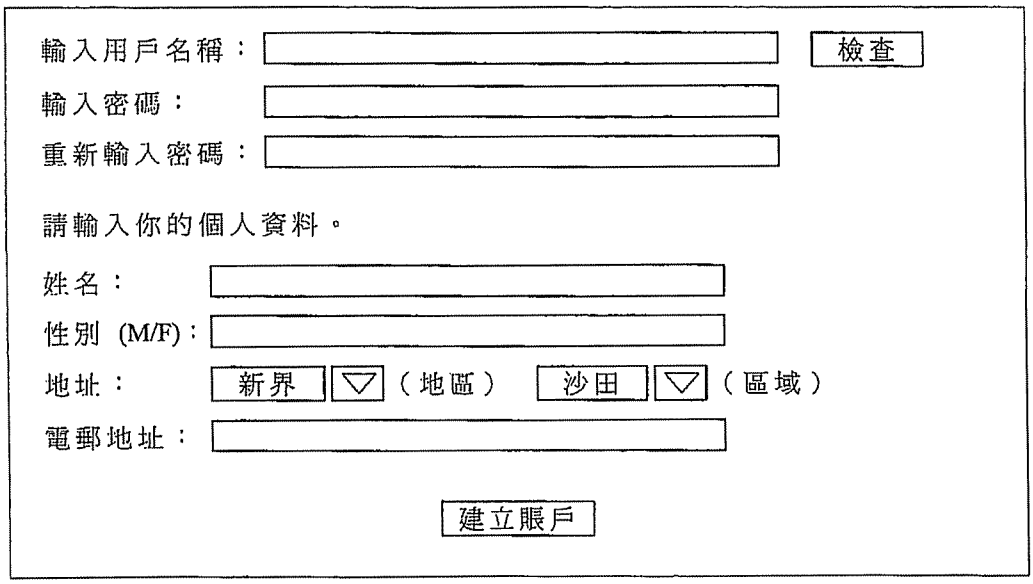
(8 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

4. 志偉打算建立一個討論區，讓會員分享旅遊體驗。在設立討論區前，他須設計一個網頁讓新用戶註冊，如下所示。



(a) 除使用文本框外，建議**兩個**方法來輸入用戶的性別。

① 按鈕

② 拉下式按鈕

（2 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

使用者要註冊一個新帳戶，需輸入一個獨有的用戶名稱，並輸入密碼兩次以作確認。他們可以點擊「檢查」按鈕以檢查用戶名稱是否已被使用。此外，所有個人資料必須填寫。

(b) 爲了驗證用戶名稱和密碼，志偉提出了下列三個方法：

方法 1：純 HTML 碼
方法 2：客戶端手稿程式
方法 3：伺服器端手稿程式

(i) 試建議方法 1、2 或 3 來驗證下列每個項目。如果多於一個適用的方法，填寫數值較小的一個。

(1) 用戶名稱由字母及數字字符所組成。 2

(2) 用戶名稱的最大長度爲 10。 1

(3) 密碼的最小長度爲 6。 1 ✗

(4) 兩個密碼是相同的。 2

(5) 用戶名稱尚未被使用。 2 ✗

3

(ii) 如在驗證過程中會自動顯示包含錯誤訊息的彈出視窗，哪個方法是適用呢？試加說明。

應用方法2，~~方法2~~ 客戶端手稿程式在核驗證用戶名稱及~~驗證~~密碼長度是否符合要求，會彈出視窗。

1

（7 分）

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) 建立帳戶後，用戶可以登入討論區，從而發布信息。

(i) 基於保安理由，人們普遍認爲身分驗證過程應該在伺服器端進行。簡略解釋爲什麼在客戶端進行身分驗證過程並不安全。

客戶端給人們認為只是驗證這新帳戶的多符，

(ii) 登入討論區後，一些用戶的認證資訊，例如用戶名稱，可以儲存在客戶端或伺服器端。

(1) 這類資訊儲存在客戶端的哪個地方？ 物數據庫

(2) 試舉出在客戶端儲存這類資訊的一個好處。

更快利用伺服器的功能

(3) 試描述如何在討論區的網頁之間利用 HTML 的隱藏文字傳遞這類認證資訊。

X

（6 分）

試卷完

本試卷所引資料的來源，將於香港考試及評核局稍後出版的《香港中學文憑考試練習卷》內列明。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

ICT 2D

Answer all questions.

1. The following algorithm processes an integer array, M, with indices from 1 to n.

Step 1: Initialise each element of M with a value equal to its index.
Step 2: p ← 2
Step 3: While $p^2 \leq n$ do Steps 4 to 7
Step 4: q ← integer part of (n/p)
Step 5: For i from 2 to q do Step 6
Step 6: M[i * p] ← 0
Step 7: p ← p + 1

Suppose n = 16. The content of M after the initialisation in Step 1 is shown below.

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	4	5	6	7	8
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
9	10	11	12	13	14	15	16

(a) (i) By using a loop, write the pseudo-code for Step 1.

For i from 1 to n do ✓
M[i] ← i

2

(ii) Fill in the content of M after each of the first two passes of the loop in Step 3.

First pass

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	0	5	0	7	0
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
9	0	11	0	13	0	15	0

2

Second pass

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	0	5	0	7	0
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
0	0	11	0	13	0	0	0

2

(iii) How many times will the loop in Step 3 be executed? 3 ✓

1

(iv) List all the values of q in sequence when the loop in Step 3 is executed.

8, 5, 4

2

(v) Study the pattern of values of M in (a)(ii). What is the purpose of the algorithm?

find out the prime number and set all non-prime number into zero. ✓

1

(10 marks)

Answers written in the margins will not be marked.

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Answers written in the margins will not be marked.

(b) Suppose Step 5 is changed to:

For i from p to q do Step 6

What is the influence of this change on the algorithm? Explain your answer briefly.

it make the algorithm more effectively and no influence to the result.

(2 marks)

(c) The algorithm is implemented and compiled into a subroutine in a library. A main program is written using the subroutine.

(i) What kind of program, code generator, debugger, linker or loader, puts the executable file of the main program into the main memory for execution?

linker

(ii) This subroutine will be linked to the executable file of the main program when the main program is running. Name this kind of linking method and give one advantage of it.

dynamic (real-time) linking

programmer can change the ~~program~~ source code & program even when the program is running

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2. John writes a program to assist air traffic controllers at an airport to keep track of landing flights. The ord of landing is handled on a first-come, first-served basis. Each flight is identified with a flight number, e.g. **A1**. John uses an array, `F`, to store a maximum of six flight numbers.

(a) `F[i]` stores the flight number of the flight that will land in the `i`-th position. i.e. `F[1]` stores the flight number of the flight that will land next.

Suppose that initially three flights **C3**, **A1** and **B2** will be landing, as shown below:

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**C3**	**A1**	**B2**			

(i) (1) Flight **C3** has landed and flight **Z6** joins the queue for landing. Complete `F` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**A1**	B2	Z6	✓		

(2) Then, flight **A1** has landed and two more flights, **S19** and **T20** subsequently, join the queue for landing. Complete `F` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	B2	Z6	S19	T20	✓	

(ii) Although the manipulation of `F` above is straightforward, it is not a good algorithm. Why not? Explain your answer briefly.

each time a flight land, all the value of the queue have to change. It is not effective.

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) Instead, John uses the following data structure to manipulate the order of landing. Two integer variables, `X` and `Y`, are used to hold two array indices of `F`.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**C3**	**A1**	**B2**			

X = 1 Y = 3

- After a flight has landed, `F[X]` will **not** be re-used. Then, `X` is increased by 1.
- When a flight joins the queue for landing, `Y` is increased by 1 and its flight number is assigned to `F[Y]`.

(i) What are the purposes of `X` and `Y` in the implementation of the data structure?

X and Y locate the location (correspondingly) of useful queue's ~~head~~ header and tailer. ✓ 2

(ii) Suppose that, at the beginning flights **C3**, **A1** and **B2** are subsequently waiting for landing with `X = 1` and `Y = 3`.

(1) Flight **C3** has landed and flight **Z6** joins the queue for landing. Complete `F`, `X` and `Y` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**C3**	A1	B2	Z6 ✓		

X = 2 ✓ Y = 4 ✓ 2

(2) Then, flight **A1** has landed and two more flights, **S19** and **T20**, subsequently join the queue for landing. Complete `F`, `X` and `Y` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**C3**	A1	B2	Z6	S19	T20 ✓

X = 3 ✓ Y = 6 ✓ 2

(iii) To determine whether all waiting flights have landed, what condition should be checked?

if (X = ~~Y~~) then all waiting flights have landed. 0

(iv) What kind of error would occur if another flight **E5** joined the queue for landing after **T20** in (b)(ii)(2)?

run time error. ✓ ... which type of run time error? 0

(8 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) John wants to develop some new systems to replace the current systems in the airport. **Tasks 1, 2 a** **3** should start after having collected user requirements (**Task 0**).

Task	Weeks to complete	Description
Task 0	5	Collect user requirements.
Task 1	20	Write, test and debug **ATC** System for air traffic controllers to use.
Task 2	15	Install display panels for **FID** System as soon as the programmer starts working on **ATC** System.
Task 3	10	Write, test and debug programs for **FID** System, after **ATC** System is completed and the display panels are installed.

(i) Complete the Gantt chart for John below.

Task \ No. of weeks	5	10	15	20	25	30	35	40	45	50
Task 0										
Task 1										
Task 2										
Task 3										

(ii) Which strategy of systems conversion should John use? Explain your answer briefly.

continue system conversion.

more than one task start doing together.

(4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

You are not allowed to add any new variables when answering Question 3. If variables are added, no marks will be awarded.

3. A program is written to emulate the selection of a track in a CD player. When the player loads a CD, the total number of tracks will be read and the default track number is 1. Pressing the buttons on the player results in the following actions:

Backward	Forward
	
When this button is pressed, the previous track will be played.	When this button is pressed, the next track will be played.

You are going to write some subprograms with the following variables to emulate the selection of a track.

Variable	Description
`TrackNum`	An integer variable to store the current track number
`TrackTotal`	An integer variable to store the total number of tracks

marking scheme!

(a) Suppose the initial track number is 1 and total number of tracks is 13. Write a subprogram or a class, `LoadInit`, to initialise `TrackNum` and `TrackTotal`, and return the two values using call by reference.

```
void LoadInit(int &TrackNum, int &TrackTotal){
*TrackNum = 1;
*TrackTotal = 13;
}
```

(3 marks)

3

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) Write a function, `BackTrack`, to return the track number after the 'Backward' button is pressed. If the current track number is 1, it remains unchanged. `TrackNum` should be passed to this function using call by value.

missing parameter

```
int BackTrack(){
    if (TrackNum == 1) return TrackNum;
    else return TrackNum - 1;
}
```

2

(3 marks)

(c) Write a function, `NextTrack`, to return the track number after the 'Forward' button is pressed. If the next track number exceeds the total number of tracks, the track number is set to 1. `TrackNum` and `TrackTotal` should be passed to this function using call by value.

missing parameters

```
int NextTrack(){
    if (TrackNum == TrackTotal) return 1;
    else return TrackNum + 1;
}
```

1

(2 marks)

(d) A new button, 'Shuffle', is to be emulated. When it is pressed, a track number will be randomly selected from 1 to `TrackTotal`.

A given function, `myrand`, without arguments can be called to return a random number r, where $0 \leq r < 1$.

Write a function, `shuffle`, to emulate the 'Shuffle' button. `TrackTotal` should be passed to `shuffle` using call by value.

missing parameters

```
int shuffle(){
    return int(myrand()* TrackTotal) + 1;
}
```

1

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(e) There should be a test plan to test the function written in Part (b). Suppose the total number of tracks is 13. For each of two different scenarios, suggest a test value and state the expected results.

(1) Test value: 2

Expected result: 1

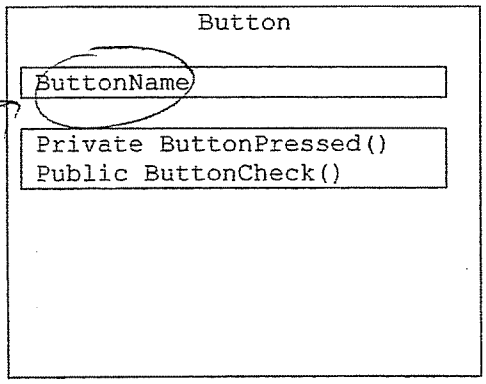
(2) Test value: 1

Expected result: 1

(2 marks)

2

(f) Suppose the program is written in an object-oriented programming language. The following *class* diagram represents button objects.



(i) How many methods are there in the class? 2

(ii) State the attribute of the class. Pressed and Checked.

(iii) What is the class name? Button

(3 marks)

2

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

[Java version]

Line	Content
1	`static int unitsConsumed;`
2	`static void usage(String clientNum, int curReading) throws IOException {`
3	`    boolean clientFound;`
4	`    String ClientST, accNum, accReading;`
5	`    int accValue;`
6	
7	`    BufferedReader infile = new BufferedReader(new`
8	`    FileReader("gas.txt"));`
9	`    ClientST = infile.readLine();`
10	`    clientFound = false;`
11	`    while (!clientFound) {`
12	`        accNum = ClientST.substring(0, 6);`
13	`        accReading = ClientST.substring(6, 10);`
14	`        if (clientNum.compareTo(accNum) == 0) {`
15	`            Part (a)(v)`
16	`            unitsConsumed = curReading - accValue;`
17	`            clientFound = true;`
18	`        }`
19	`        ClientST = infile.readLine();`
20	`    }`
21	`    Part (c)`
22	`}`

(a) (i) It is known that the last digit of `accNum` is a check digit. What is the purpose of this check digit?

To make sure there is no input / tramission error.

(ii) In terms of scope, what kind of variable is declared from Line 3 to Line 6?

~~relative~~ varible
Local

(iii) What is the purpose of `clientNum` in calculating the gas consumed?

To store the accNum which need to be ~~calu~~ calculated.

(iv) What is the purpose of `clientFound` in calculating the gas consumed?

To determine whether the ~~clien~~ client have been found or not

(v) In Line 15, what operation on `accReading` should be carried out?

accValue = accReading[0]*1000 + accReading[1]*100 + accReading[2]*10 + accReading[3]; (5 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) The gas meter reading of the client with the account number `678900` in the current month is `0012`.

(i) Suggest a problem that might be caused by the statement in Line 16.

it return negative value.

(ii) Insert an IF statement after Line 16 to solve this problem.

if (unitConsumed < 0) ~~unitConsumed = UnitCosumed + 10000~~;
unitConsumed = unitCosumed + 10000;

(3 marks)

(c) Write a program statement in Line 21 to perform a proper file handling operation.

fclose(infile);

(1 mark)

(d) The `while` loop might become an infinite loop.

(i) Why? ~~no~~ that client's account number is not in the file.

(ii) Rewrite the first line of the `while` loop to prevent this problem.

while ((!clientFound)&&(infile!=EOF))

(3 marks)

(e) The gas company has decided to replace the old system with a new system. A team of three members is responsible for developing the new system, as shown below:

- a project manager (PM);
- a system analyst (SA); and
- a programmer (P)

Match the major duties with the team members. The first one is an example.

Major duties	Team member
Assign resources and roles to members of the development team.	PM
Collect user requirements and write the user requirement specification.	SA
Set essential milestones of the development plan.	PM
Code the program and carry out testing.	P

(3 marks)

END OF PAPER

2
1
1
2
3

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Answers written in the margins will not be marked.

Answer all questions.

1. The following algorithm processes an integer array, M, with indices from 1 to n.

Step 1: Initialise each element of M with a value equal to its index.
Step 2: p ← 2
Step 3: While $p^2 \leq n$ do Steps 4 to 7
Step 4: q ← integer part of (n/p)
Step 5: For i from 2 to q do Step 6
Step 6: M[i * p] ← 0
Step 7: p ← p + 1

Suppose n = 16. The content of M after the initialisation in Step 1 is shown below.

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	4	5	6	7	8
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
9	10	11	12	13	14	15	16

(a) (i) By using a loop, write the pseudo-code for Step 1. 2

Step 1.1 For i from 1 to n do Step 1.2

Step 1.2 M[i] ← i

(ii) Fill in the content of M after each of the first two passes of the loop in Step 3. 2

First pass

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	0	5	0	7	0
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
9	0	11	0	13	0	15	0

Second pass

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	0	5	0	7	0
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
0	0	11	0	13	0	0	0

(iii) How many times will the loop in Step 3 be executed? 3 2

(iv) List all the values of q in sequence when the loop in Step 3 is executed. 1

8, 5, 4

(v) Study the pattern of values of M in (a)(ii). What is the purpose of the algorithm? 2

Find the prime numbers between 1 and n (and 1) 1

(10 marks)

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Answers written in the margins will not be marked.

(b) Suppose Step 5 is changed to:

For i from p to q do Step 6

What is the influence of this change on the algorithm? Explain your answer briefly.

It will reduce the runtime of the ~~program~~ ~~but~~ while having the same result. Cause p B always larger or equal to 2. ✓

(2 marks)

2

(c) The algorithm is implemented and compiled into a subroutine in a library. A main program is written using the subroutine.

(i) What kind of program, code generator, debugger, linker or loader, puts the executable file of the main program into the main memory for execution?

loader.

1

(ii) This subroutine will be linked to the executable file of the main program when the main program is running. Name this kind of linking method and give one advantage of it.

dynamic linking (DLL in windows) Interrupted ; It let the program to call the functions instead of rewriting it, to reduce the software ✗ develope time.

(3 marks)

0

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Answers written in the margins will not be marked.

2. John writes a program to assist air traffic controllers at an airport to keep track of landing flights. The ord of landing is handled on a first-come, first-served basis. Each flight is identified with a flight number, e.g. **A1**. John uses an array, `F`, to store a maximum of six flight numbers.

(a) `F[i]` stores the flight number of the flight that will land in the `i`-th position. i.e. `F[1]` stores the flight number of the flight that will land next.

Suppose that initially three flights **C3**, **A1** and **B2** will be landing, as shown below:

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**C3**	**A1**	**B2**			

(i) (1) Flight **C3** has landed and flight **Z6** joins the queue for landing. Complete `F` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**A1**	B2	Z6			

(2) Then, flight **A1** has landed and two more flights, **S19** and **T20** subsequently, join the queue for landing. Complete `F` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	B2	Z6	S19	T20		

(ii) Although the manipulation of `F` above is straightforward, it is not a good algorithm. Why not? Explain your answer briefly.

It need to replace all of the element after every flights landed, which will consum a lot of computing power and have a long runtime.

(3 marks)

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Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) Instead, John uses the following data structure to manipulate the order of landing. Two integer variables, `X` and `Y`, are used to hold two array indices of `F`.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**C3**	**A1**	**B2**			

- After a flight has landed, `F[X]` will **not** be re-used. Then, `X` is increased by 1.
- When a flight joins the queue for landing, `Y` is increased by 1 and its flight number is assigned to `F[Y]`.

(i) What are the purposes of `X` and `Y` in the implementation of the data structure?

Has Pointing the first and the last element in the queue. 2

(ii) Suppose that, at the beginning flights **C3**, **A1** and **B2** are subsequently waiting for landing with `X = 1` and `Y = 3`.

(1) Flight **C3** has landed and flight **Z6** joins the queue for landing. Complete `F`, `X` and `Y` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**C3**	A1	B2	Z6		

X = 2 Y = 4 2

(2) Then, flight **A1** has landed and two more flights, **S19** and **T20**, subsequently join the queue for landing. Complete `F`, `X` and `Y` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**C3**	A1	B2	Z6	S19	T20

X = 3 Y = 6 2

(iii) To determine whether all waiting flights have landed, what condition should be checked?

X > Y 1

(iv) What kind of error would occur if another flight **E5** joined the queue for landing after **T20** in (b)(ii)(2)?

Runtime error, cause there are no F[7] defined. 1

(8 marks)

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Answers written in the margins will not be marked.

(c) John wants to develop some new systems to replace the current systems in the airport. **Tasks 1, 2 a 3** should start after having collected user requirements (**Task 0**).

Task	Weeks to complete	Description
Task 0	5	Collect user requirements.
Task 1	20	Write, test and debug **ATC** System for air traffic controllers to use.
Task 2	15	Install display panels for **FID** System as soon as the programmer starts working on **ATC** System.
Task 3	10	Write, test and debug programs for **FID** System, after **ATC** System is completed and the display panels are installed.

(i) Complete the Gantt chart for John below.

No. of weeks / Task	5	10	15	20	25	30	35	40	45	50
Task 0										
Task 1										
Task 2										
Task 3										

(ii) Which strategy of systems conversion should John use? Explain your answer briefly.

John should Switch the whole System in one night, because if one part of the airport not using the same system, it may cause a problem.

(4 marks)

(Full Conversion,)

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Answers written in the margins will not be marked.

You are not allowed to add any new variables when answering Question 3. If variables are added, no marks will be awarded.

3. A program is written to emulate the selection of a track in a CD player. When the player loads a CD, the total number of tracks will be read and the default track number is 1. Pressing the buttons on the player results in the following actions:

Backward	Forward
	
When this button is pressed, the previous track will be played.	When this button is pressed, the next track will be played.

You are going to write some subprograms with the following variables to emulate the selection of a track.

Variable	Description
`TrackNum`	An integer variable to store the current track number
`TrackTotal`	An integer variable to store the total number of tracks

(a) Suppose the initial track number is 1 and total number of tracks is 13. Write a subprogram or a class, `LoadInit`, to initialise `TrackNum` and `TrackTotal`, and return the two values using call by reference.

```
procedure LoadInit(var TrackNum : Integer, var TrackTotal : Integer);
begin
TrackNum := 1;
TrackTotal := 13;
end.
```

(3 marks)

3

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) Write a function, `BackTrack`, to return the track number after the 'Backward' button is presse... the current track number is 1, it remains unchanged. `TrackNum` should be passed to this functi... using call by value.

```
Function BackTrack( TrackNum : Integer) : Integer;
  begin
    If ( TrackNum = 1, Then
        BackTrack := 1;
    else BackTrack := TrackNum - 1;
  end;
```

Poor Presentation

3

(3 marks)

(c) Write a function, `NextTrack`, to return the track number after the 'Forward' button is pressed. If the next track number exceeds the total number of tracks, the track number is set to 1. `TrackNum` and `TrackTotal` should be passed to this function using call by value.

```
Function NextTrack ( TrackNum, TrackTotal : Integer) : Integer;
  begin
    if TrackNum = TrackTotal then
        NextTrack := 1
    else NextTrack := TrackNum+1;
  end;
```

2

(2 marks)

(d) A new button, 'Shuffle', is to be emulated. When it is pressed, a track number will be randomly selected from 1 to `TrackTotal`.

A given function, `myrand`, without arguments can be called to return a random number r, where $0 \leq r < 1$.

Write a function, `shuffle`, to emulate the 'Shuffle' button. `TrackTotal` should be passed to `shuffle` using call by value.

```
Function shuffle( TrackTotal : Integer) : Integer;
  begin
    shuffle := Trunc( myrand() * TrackTotal) +1;
  end;
```

2

(2 marks)

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Answers written in the margins will not be marked.

(e) There should be a test plan to test the function written in Part (b). Suppose the total number of track is 13. For each of two different scenarios, suggest a test value and state the expected results.

(1) Test value: 13

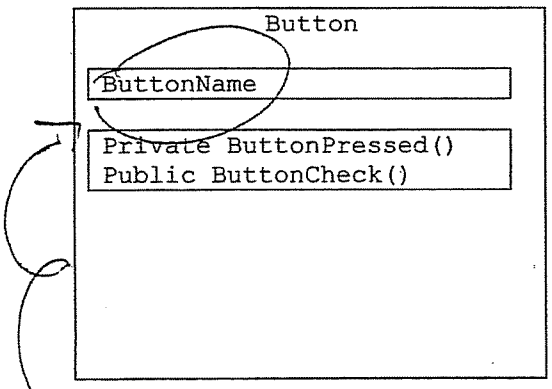
Expected result: 12

(2) Test value: 1

Expected result: 1

(2 marks)

(f) Suppose the program is written in an object-oriented programming language. The following *class* diagram represents button objects.



(i) How many methods are there in the class? 2

(ii) State the attribute of the class. action on a button

(iii) What is the class name? Button

(3 marks)

2

2

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

[Java version]

Line	Content
1	`static int unitsConsumed;`
2	`static void usage(String clientNum, int curReading) throws IOException {`
3	`    boolean clientFound;`
4	`    String ClientST, accNum, accReading;`
5	`    int accValue;`
6	
7	`    BufferedReader infile = new BufferedReader(new`
8	`    FileReader("gas.txt"));`
9	`    ClientST = infile.readLine();`
10	`    clientFound = false;`
11	`    while (!clientFound) {`
12	`        accNum = ClientST.substring(0, 6);`
13	`        accReading = ClientST.substring(6, 10);`
14	`        if (clientNum.compareTo(accNum) == 0) {`
15	`            Part (a)(v)`
16	`            unitsConsumed = curReading - accValue;`
17	`            clientFound = true;`
18	`        }`
19	`        ClientST = infile.readLine();`
20	`    }`
21	`    Part (c)`
22	`}`

(a) (i) It is known that the last digit of `accNum` is a check digit. What is the purpose of this check digit?

To prevent mistyped the account number.

(ii) In terms of scope, what kind of variable is declared from Line 3 to Line 6?

local variable.

(iii) What is the purpose of `clientNum` in calculating the gas consumed?

To store the client's account number needed to be find.

(iv) What is the purpose of `clientFound` in calculating the gas consumed?

To check if the client if found and calculated the consume.

(v) In Line 15, what operation on `accReading` should be carried out?

Convert from string to integer, and store the result in accValue

(5 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) The gas meter reading of the client with the account number `678900` in the current month is `0012`

(i) Suggest a problem that might be caused by the statement in Line 16.

May return a negative value.

(ii) Insert an IF statement after Line 16 to solve this problem.

```
IF accValue > CurReading then
unitsConsumed := CurReading + 10000 - accValue;
```

(3 marks)

(c) Write a program statement in Line 21 to perform a proper file handling operation.

```
Close('Gas.txt');
```

infile

(1 mark)

(d) The `while` loop might become an infinite loop.

(i) Why? If the account number need to be search is not appear in 'Gas.txt'. infinite loop occur.

(ii) Rewrite the first line of the `while` loop to prevent this problem.

```
while ((not ClientFound) and (not eof(infile)) do
```

(3 marks)

(e) The gas company has decided to replace the old system with a new system. A team of three members is responsible for developing the new system, as shown below:

- a project manager (PM);
- a system analyst (SA); and
- a programmer (P)

Match the major duties with the team members. The first one is an example.

Major duties	Team member
Assign resources and roles to members of the development team.	PM
Collect user requirements and write the user requirement specification.	SA.
Set essential milestones of the development plan.	~~SA~~
Code the program and carry out testing.	P

(3 marks)

END OF PAPER

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Answers written in the margins will not be marked.

Answer all questions.

1. The following algorithm processes an integer array, `M`, with indices from `1` to `n`.

```
Step 1: Initialise each element of M with a value equal to its index.
Step 2: p ← 2
Step 3: While p² ≤ n do Steps 4 to 7
Step 4:     q ← integer part of (n/p)
Step 5:     For i from 2 to q do Step 6
Step 6:         M[i * p] ← 0
Step 7:     p ← p + 1
```

Suppose `n` = 16. The content of `M` after the initialisation in Step 1 is shown below.

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	4	5	6	7	8
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
9	10	11	12	13	14	15	16

(a) (i) By using a loop, write the pseudo-code for Step 1.

```
for i := 1 to n do
    M[i] := i;
```

(ii) Fill in the content of `M` after each of the first two passes of the loop in Step 3.

First pass

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	0	5	0	7	0
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
9	0	11	0	13	0	15	0

Second pass

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	0	5	0	7	0
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
0	0	11	0	13	0	0	0

(iii) How many times will the loop in Step 3 be executed? three times

(iv) List all the values of `q` in sequence when the loop in Step 3 is executed.

8; 5, 4

(v) Study the pattern of values of `M` in (a)(ii). What is the purpose of the algorithm?

To find the prime numbers in the array.

(10 marks)

2 1 1 2 2 1 2 1

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2x2 4 4x8 16.
2x3 6 3x3 9
2x4 8 3x4 12
2x5 10 3x5 15 to 8.
2x6 12 4x4 16. 3 to 7.
2x7 14

(b) Suppose Step 5 is changed to: 4 to 4

For i from p to q do Step 6

What is the influence of this change on the algorithm? Explain your answer briefly.

Can be more faster to find the product number and no repeat to find, eg. M[2x2] in "For i from 2 to 8 do Step 6" that will not repeat in "For i from 3 to 7 do Step 6".

(2 marks)

2

(c) The algorithm is implemented and compiled into a subroutine in a library. A main program is written using the subroutine.

(i) What kind of program, code generator, debugger, linker or loader, puts the executable file of the main program into the main memory for execution?

Linker.

(ii) This subroutine will be linked to the executable file of the main program when the main program is running. Name this kind of linking method and give one advantage of it.

Library Linking.

(3 marks)

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2. John writes a program to assist air traffic controllers at an airport to keep track of landing flights. The order of landing is handled on a first-come, first-served basis. Each flight is identified with a flight number, e.g. **A1**. John uses an array, `F`, to store a maximum of six flight numbers.

(a) `F[i]` stores the flight number of the flight that will land in the `i`-th position. i.e. `F[1]` stores the flight number of the flight that will land next.

Suppose that initially three flights **C3**, **A1** and **B2** will be landing, as shown below:

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**C3**	**A1**	**B2**			

(i) (1) Flight **C3** has landed and flight **Z6** joins the queue for landing. Complete `F` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**A1**	B2	Z6			

(2) Then, flight **A1** has landed and two more flights, **S19** and **T20** subsequently, join the queue for landing. Complete `F` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	B2	Z6	S19	T20		

(ii) Although the manipulation of `F` above is straightforward, it is not a good algorithm. Why not? Explain your answer briefly.

There are head always change that can't count, how many flight ~~here~~ landing ~~every~~ everyday.

(3 marks)

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Answers written in the margins will not be marked.

stacks last in first out
queues
linked list

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(b) Instead, John uses the following data structure to manipulate the order of landing. Two integer variables, `X` and `Y`, are used to hold two array indices of `F`.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	C3	A1	B2			

- After a flight has landed, `F[X]` will **not** be re-used. Then, `X` is increased by 1.
- When a flight joins the queue for landing, `Y` is increased by 1 and its flight number is assigned to `F[Y]`.

(i) What are the purposes of `X` and `Y` in the implementation of the data structure?

X is the head of the queue and Y is the tail of the queue. 2

(ii) Suppose that, at the beginning flights **C3**, **A1** and **B2** are subsequently waiting for landing with `X = 1` and `Y = 3`.

(1) Flight **C3** has landed and flight **Z6** joins the queue for landing. Complete `F`, `X` and `Y` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	C3	A1	B2	Z6		

X = 2 Y = 4 2

(2) Then, flight **A1** has landed and two more flights, **S19** and **T20**, subsequently join the queue for landing. Complete `F`, `X` and `Y` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	C3	A1	B2	Z6	S19	T20

X = 3 Y = 6. 2

(iii) To determine whether all waiting flights have landed, what condition should be checked?

Check the X=1 and Y=6 0

(iv) What kind of error would occur if another flight **E5** joined the queue for landing after **T20** in (b)(ii)(2)?

The upper error would occur. 0

(8 marks)

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Answers written in the margins will not be marked.

(c) John wants to develop some new systems to replace the current systems in the airport. Tasks 1, 2 and 3 should start after having collected user requirements (Task 0).

Task	Weeks to complete	Description
Task 0	5	Collect user requirements.
Task 1	20	Write, test and debug **ATC** System for air traffic controllers to use.
Task 2	15	Install display panels for **FID** System as soon as the programmer starts working on **ATC** System.
Task 3	10	Write, test and debug programs for **FID** System, after **ATC** System is completed and the display panels are installed.

Task 1
Task 2 ↑ ok

(i) Complete the Gantt chart for John below.

Task \ No. of weeks	5	10	15	20	25	30	35	40	45	50
Task 0										
Task 1										
Task 2										
Task 3										

1

(ii) Which strategy of systems conversion should John use? Explain your answer briefly.

John should use ATC System. It is because the ATC System has finished the system development earlier than FID System.

(4 marks)

1

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Please stick the barcode lab

You are not allowed to add any new variables when answering Question 3. If variables are added, no marks will be awarded.

3. A program is written to emulate the selection of a track in a CD player. When the player loads a CD, the total number of tracks will be read and the default track number is 1. Pressing the buttons on the player results in the following actions:

Backward	Forward
	
When this button is pressed, the previous track will be played.	When this button is pressed, the next track will be played.

You are going to write some subprograms with the following variables to emulate the selection of a track.

Variable	Description
`TrackNum`	An integer variable to store the current track number
`TrackTotal`	An integer variable to store the total number of tracks

(a) Suppose the initial track number is 1 and total number of tracks is 13. Write a subprogram or a class, `LoadInit`, to initialise `TrackNum` and `TrackTotal`, and return the two values using call by reference.

```
procedure LoadInit(var TrackNum, TrackTotal : integer);
begin
    TrackNum := 1;
    TrackTotal := 13;
end;
```

(3 marks)

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Answers written in the margins will not be marked.

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(b) Write a function, `BackTrack`, to return the track number after the 'Backward' button is pressed. If the current track number is 1, it remains unchanged. `TrackNum` should be passed to this function using call by value.

```
procedure BackTrack (TrackNum : integer);
begin
  if TrackNum = 1
    than TrackNum := 1
    else TrackNum := TrackNum - 1;
end;
```

(3 marks)

(c) Write a function, `NextTrack`, to return the track number after the 'Forward' button is pressed. If the next track number exceeds the total number of tracks, the track number is set to 1. `TrackNum` and `TrackTotal` should be passed to this function using call by value.

```
procedure NextTrack (TrackNum, TrackTotal : integer);
begin
  if TrackNum = TrackTotal
    then TrackNum := 1
    else TrackNum := TrackNum - 1;
end;
```

(2 marks)

(d) A new button, 'Shuffle', is to be emulated. When it is pressed, a track number will be randomly selected from 1 to `TrackTotal`.

A given function, `myrand`, without arguments can be called to return a random number r, where $0 \leq r < 1$.

Write a function, `shuffle`, to emulate the 'Shuffle' button. `TrackTotal` should be passed to `shuffle` using call by value.

```
function shuffle (TrackTotal : integer) : integer;
begin
  myrand(r);
  shuffle := int(r * TrackTotal) + 1;
end;
```

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(e) There should be a test plan to test the function written in Part (b). Suppose the total number of tracks is 13. For each of two different scenarios, suggest a test value and state the expected results.

(1) Test value: 5

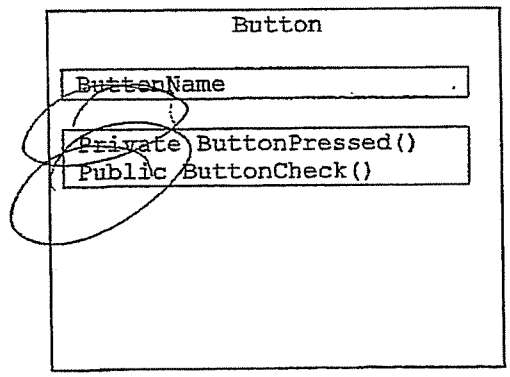
Expected result: 4.

(2) Test value: 1

Expected result: 1

(2 marks)

(f) Suppose the program is written in an object-oriented programming language. The following *class* diagram represents button objects.



(i) How many methods are there in the class? 3

(ii) State the attribute of the class. to press to run the function

(iii) What is the class name? Button

(3 marks)

random(60) +1

0 ~ 59.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

[Java version]

Line	Content
1	`static int unitsConsumed;`
2	`static void usage(String clientNum, int curReading) throws IOException {`
3	`    boolean clientFound;`
4	`    String ClientST, accNum, accReading;`
5	`    int accValue;`
6	
7	`    BufferedReader infile = new BufferedReader(new`
8	`    FileReader("gas.txt"));`
9	`    ClientST = infile.readLine();`
10	`    clientFound = false;`
11	`    while (!clientFound) {`
12	`        accNum = ClientST.substring(0, 6);`
13	`        accReading = ClientST.substring(6, 10);`
14	`        if (clientNum.compareTo(accNum) == 0) {`
15	`            Part (a)(v)`
16	`            unitsConsumed = curReading - accValue;`
17	`            clientFound = true;`
18	`        }`
19	`        ClientST = infile.readLine();`
20	`    }`
21	`    Part (c)`
22	`}`

(a) (i) It is known that the last digit of accNum is a check digit. What is the purpose of this check digit?

To be sure that the record has ~~found~~ correctly.

(ii) In terms of scope, what kind of variable is declared from Line 3 to Line 6?

Text, boolean, string and integer.

(iii) What is the purpose of clientNum in calculating the gas consumed?

To enter the account number of client that want to find in the ~~text~~ file throughthe the procedure.

(iv) What is the purpose of clientFound in calculating the gas consumed?

To ensure that the record ~~it~~ has started to find and run the Step 10 to Step 15.

(v) In Line 15, what operation on accReading should be carried out?

Enter the ~~curRea~~ accReading into the variable of clientReading. (5 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) The gas meter reading of the client with the account number `678900` in the current month is `0012`.

(i) Suggest a problem that might be caused by the statement in Line 16.

The range will over run the that the current

(ii) Insert an IF statement after Line 16 to solve this problem.

IF IF .

(3 marks)

(c) Write a program statement in Line 21 to perform a proper file handling operation.

writeln(unitsConsumed);

(1 mark)

(d) The `while` loop might become an infinite loop.

(i) Why? It is because the record can't find, the clientFound doesn't change to false.

(ii) Rewrite the first line of the `while` loop to prevent this problem.

while not clientFound.

(3 marks)

(e) The gas company has decided to replace the old system with a new system. A team of three members is responsible for developing the new system, as shown below:

- a project manager (PM);
- a system analyst (SA); and
- a programmer (P)

Match the major duties with the team members. The first one is an example.

Major duties	Team member
Assign resources and roles to members of the development team.	PM
Collect user requirements and write the user requirement specification.	SA
Set essential milestones of the development plan.	SA
Code the program and carry out testing.	P

(3 marks)

END OF PAPER

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

本試卷全部試題均須回答。

1. 下列算法處理整數陣列 M，其索引由 1 至 n。

步驟 1：初始化 M 每個元素的值爲其索引。
步驟 2：p ← 2
步驟 3：當 $p^2 \leq n$，執行步驟 4 至 7
步驟 4：　　q ← (n/p) 的整數部分
步驟 5：　　設 i 由 2 至 q，執行步驟 6
步驟 6：　　M[i * p] ← 0
步驟 7：　　p ← p + 1

假設 n = 16，M 的內容經步驟 1 初始化後如下所示。

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	4	5	6	7	8
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
9	10	11	12	13	14	15	16

(a) (i) 利用循環寫出步驟 1 的僞代碼。

array M = M[1] (16)

(ii) 填上步驟 3 的循環首兩遍迭代後 M 的內容。

第一遍

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	0	5	0	7	0
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
9	0	11	0	13	0	15	0

第二遍

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	0	5	0	7	0
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
0	0	11	0	13	0	0	0

(iii) 步驟 3 的循環執行了多少次？ 3

(iv) 按序列出當步驟 3 的循環執行時所有 q 的值。

8, 5, 4

(v) 細看在 (a)(ii) M 值的樣式。這個算法有什麼用途？

把陣列中除 M[2] 外的雙數陣列數值設成零。

(10 分)

寫於邊界以外的答案，將不予評閱。

請在此貼上電腦條

(b) 假設步驟 5 改動爲

設 i 由 p 至 q，執行步驟 6

這個改動對此算法有何影響？試簡略說明。

有助減少重覆之前已執行的步驟3循環內容，能加快程式運行。

(2 分)

(c) 此算法透過一個程式編譯成爲子程式庫內的一個子程式。某主程式以這個子程式來編寫。

(i) 代碼生成器、偵錯程式、連接程式和載入程式這四類程式中，哪一類程式把這個主程式的可執行檔案放進主記憶體內執行？

載入程式

(ii) 當執行這個主程式時，這個子程式會與主程式的可執行檔案連接。試寫出此類連接方法的名稱，並舉出其中一個優點。

按址調用，或點對點連接，可以成功接達該子程式而不怕連接錯誤的子程式，準確性高。

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

2. 志明編寫了一個程式，協助機場航空交通管制員記錄將要降落的航班，降落的次序是先到先處理。每一航班以其航班編號來識別，例如 **A1**。志明使用一個陣列 F 來儲存最多六個航班編號。

(a) F[i] 儲存第 i 班要降落航班的航班編號，即 F[1] 儲存下一班要降落航班的航班編號。

假設最初有三班航班 **C3**、**A1** 和 **B2** 要降落，如下所示：

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	**C3**	**A1**	**B2**			

(i) (1) 航班 **C3** 已降落，而航班 **Z6** 加入，等候降落。試完成下列 F。

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	**A1**	B2	Z6			

(2) 然後，航班 **A1** 已降落，而兩班航班 **S19** 和 **T20** 隨後依次加入，等候降落。試完成下列 F。

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	B2	Z6	S19	T20		

(ii) 雖然以上對 F 的操控簡單直接，但它不是一個好算法，爲什麼？試簡略說明。

那是因為我們要把已降落的航班編號移除，再把等候降落的名單依次向前移位，最後要檢查空位才可把新加入等候名單的航班編號加入，即逐次更新。

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

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(b) 志明有另一選擇，他可利用以下的數據結構操控降落的次序。整數變量 X 和 Y 是用來儲存 F 的陣列索引。

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	C3	A1	B2			

- 當一航班降落後，F[X] **不會**再被採用。之後，X 的值便增加 1。
- 當一航班加入等待降落，Y 的值便增加 1，而其航班編號會賦值至 F[Y]。

(i) X 和 Y 在實現這個數據結構時有什麼功能？

可以用來標示隊頭和隊尾，方便列明航班的降落次序和允許新航班加入等候名單。 2

(ii) 假設初始時航班 **C3**、**A1** 和 **B2** 依次等待降落，而 X=1 和 Y=3。

(1) 航班 **C3** 已降落，而航班 **Z6** 加入，等候降落。試完成下列 F、X 和 Y。

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	C3	A1	B2	Z6		

X= 2 Y= 4 2

(2) 然後，航班 **A1** 已降落，而兩班航班 **S19** 和 **T20** 隨後依次加入，等候降落。試完成下列 F、X 和 Y。

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	C3	A1	B2	Z6	S19	T20

X= 3 Y= 6 2

(iii) 要確定是否所有等候降落的航班都已降落，須要檢查哪一項條件？

X>Y 1

(iv) 若在 (b)(ii)(2) 的航班 **T20** 降落後，另一航班 **E5** 加入，等候降落。這樣會出現哪類錯誤？

上溢錯誤 1

(8 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) 志明要開發一些新系統取代機場現有的系統，完成收集用戶要求（**任務 0**）後便可開始**任務 1**、**2** 和 **3**。

任務	完成任務所須的週數	描述
任務 0	5	收集用戶要求。
任務 1	20	編寫、測試和偵錯供航空交通管制員使用的 **ATC** 系統。
任務 2	15	當程式編寫員開始編寫 **ATC** 系統，便可在接機大堂安裝 **FID** 系統顯示屏幕。
任務 3	10	完成 **ATC** 系統和安裝顯示屏幕後，便可編寫、測試和偵錯 **FID** 系統的程式。

(i) 試爲志明完成以下的甘特圖。

任務 \ 週數	5	10	15	20	25	30	35	40	45	50
任務 0										
任務 1										
任務 2										
任務 3										

(ii) 志明應使用哪種系統轉換策略？試簡略說明。

階段式系統轉換，可以把工作分階段進行，完成一項任務才開始第二項任務，不會同時進行。

(4 分)

3 0

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

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作答第 3 題時，考生不得加入新的變量，否則不獲給分。

3. 某程式模擬在唱片播放機內的選擇曲目。此播放機載入唱片後會讀取曲目的總數，而預設的曲目編號是 1。播放機按鈕的作用如下展示。

向後	向前
	
按下此按鈕會播放上一首曲目	按下此按鈕會播放下一首曲目

考生需使用下列變量來編寫一些子程式，模擬選擇曲目。

變量	描述
TrackNum	儲存當前曲目編號整數變量
TrackTotal	儲存曲目總數整數變量

(a) 假設初始的曲目編號是 1，而曲目總數是 13。編寫子程式或類別 LoadInit 來初始化 TrackNum 和 TrackTotal，並以按址調用方式返回這兩個值。

```
void LoadInit ()
{   TrackNum = 1;
    TrackTotal = 13; }
```

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(b) 編寫函數 BackTrack 返回按下「向後」按鈕後的曲目編號，若當前曲目編號是 1，則其值保持不變。TrackNum 需以按值調用方式傳遞至此函數。

```
int BackTrack;
if (TrackNum == 1)
    BackTrack = 1;
else BackTrack = TrackNum - 1;
```

(3 分)

(c) 編寫函數 NextTrack 返回按下「向前」按鈕後的曲目編號，若下一首曲目編號超過曲目總數，則將曲目編號設定爲 1。TrackNum 和 TrackTotal 需以按值調用方式傳遞至此函數。

```
int NextTrack;
if (TrackNum < TrackTotal)
    NextTrack = TrackNum + 1;
else NextTrack = 1;
```

(2 分)

(d) 模擬一個新的「隨意選擇」按鈕，使按下此按鈕後便會從曲目編號 1 至 TrackTotal 當中隨機選擇一首曲目。

已知函數 myrand 無需變元而可被調用，並返回一隨機數 r，而 $0 \le r < 1$。

試編寫函數 shuffle 模擬「隨意選擇」按鈕，而 TrackTotal 需以按值調用方式傳遞至 shuffle。

```
int shuffle;
int myrand;
shuffle = TrackTotal - myrand;
```

(2 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(e) 測試 (b) 內的函數是需要一個測試計劃。假設曲目總數是 13，提議兩種不同情境的測試值及其預期結果。

(1) 測試值： 13 /

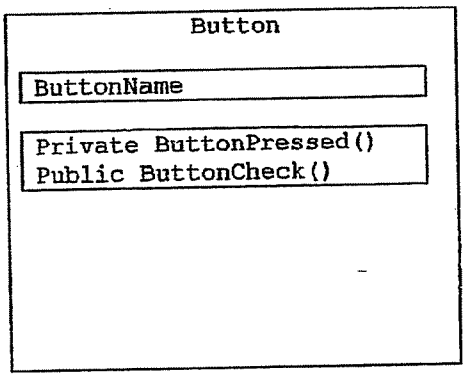
預期結果： 12 /

(2) 測試值： 1 /

預期結果： 1 /

(2 分) 2

(f) 假設這個程式以物件導向程式語言編寫，下列的*類別*圖代表按鈕物件。



(i) 這個類別有多少個方法？ 2 個 /

(ii) 寫出這個類別的屬性。 Pressed /

(iii) 這個類別的名稱是什麼？ Button /

(3 分) 2

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

[Java 版本]

行號	內容
1	`static int unitsConsumed;`
2	`static void usage(String clientNum, int curReading) throws IOException {`
3	`    boolean clientFound;`
4	`    String ClientST, accNum, accReading;`
5	`    int accValue;`
6	
7	`    BufferedReader infile = new BufferedReader(new`
8	`    FileReader("gas.txt"));`
9	`    ClientST = infile.readLine();`
10	`    clientFound = false;`
11	`    while (!clientFound) {`
12	`        accNum = ClientST.substring(0, 6);`
13	`        accReading = ClientST.substring(6, 10);`
14	`        if (clientNum.compareTo(accNum) == 0) {`
15	`            (a)(v) 部`
16	`            unitsConsumed = curReading - accValue;`
17	`            clientFound = true;`
18	`        }`
19	`        ClientST = infile.readLine();`
20	`    }`
21	`    (c) 部`
22	`}`

(a) (i) 已知 accNum 的最後一個數位是檢查數位，這個檢查數位的功能是什麼？

檢查該客戶號碼是否存在，避免有虛假用戶。

(ii) 就作用域 (scope) 而言，在行號 3 至 6 所說明的變量是哪種變量？

函數變量。

(iii) clientNum 在計算煤氣用量時有什麼作用？

用作查找該客戶原有的煤氣用量，方便於計算時把煤氣用量累加。

(iv) clientFound 在計算煤氣用量時有什麼作用？

用作表明能否尋找客戶資料。

(v) 在行號 15 要對 accReading 進行什麼操作？

accReading = accValue;

(5 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(b) 客戶號碼爲 678900 的客戶在本月的煤氣錶讀數是 0012。

(i) 提出一項可由行號 16 內的語句引致的問題。

邏輯錯誤，運算後所得的值不能是負值。 1

(ii) 寫出在行號 16 後插入的一句 IF 語句來解決此問題。

if (accValue < curReading) {

(3 分)

(c) 寫出行號 21 的程式語句作正確的檔案處理操作。

FILE * outFile;

(1 分)

(d) while 循環可能會變成一個無限循環。

(i) 爲什麼？ !clientFound 條件可能持久符合 1

(ii) 重寫 while 循環的第一行，以避免這個問題出現。

while (clientNum == 0)

(3 分)

(e) 煤氣燃料公司決定以一個新系統取代舊系統，由以下三名成員組成的團隊負責開發這個新系統：

- 項目經理 (PM)
- 系統分析員 (SA)
- 程式編寫員 (P)

配對下列團隊成員的職責。第一項是例子。

主要職責	團隊成員
分配資源和角色予各開發團隊成員。	PM
收集用戶要求和撰寫用戶要求規格。	SA
制訂開發計劃內重要的里程碑。	PM
編寫程式及進行測試。	P

(3 分) 3

試卷完

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

Answer all questions.

1. The following algorithm processes an integer array, `M`, with indices from `1` to `n`.

Step 1: Initialise each element of `M` with a value equal to its index.
Step 2: `p` ← 2
Step 3: While $p^2 \leq n$ do Steps 4 to 7
Step 4: `q` ← integer part of (n/p)
Step 5: For `i` from 2 to `q` do Step 6
Step 6: `M[i * p]` ← 0
Step 7: `p` ← `p` + 1

n=16
1
2
3
4

Suppose `n` = 16. The content of `M` after the initialisation in Step 1 is shown below.

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	4	5	6	7	8
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
9	10	11	12	13	14	15	16

(a) (i) By using a loop, write the pseudo-code for Step 1.

for M:= 1 to n do Step 2

(ii) Fill in the content of `M` after each of the first two passes of the loop in Step 3.

First pass

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
0	2	3	0	5	0	7	0
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
0	10	11	0	13	14	15	0

n=16

Second pass

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
0	0	0	0	5	0	7	0
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
0	10	11	0	13	14	15	0

(iii) How many times will the loop in Step 3 be executed? 6

(iv) List all the values of `q` in sequence when the loop in Step 3 is executed.

1, 2, 3, 4

(v) Study the pattern of values of `M` in (a)(ii). What is the purpose of the algorithm?

The multiple that smaller than 16 will become zero

(10 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode lab

(b) Suppose Step 5 is changed to:

For i from p to q do Step 6

What is the influence of this change on the algorithm? Explain your answer briefly.

It will be sure the number must include 0 and 1

(2 marks)

(c) The algorithm is implemented and compiled into a subroutine in a library. A main program is written using the subroutine.

(i) What kind of program, code generator, debugger, linker or loader, puts the executable file of the main program into the main memory for execution?

The system of library management.

(ii) This subroutine will be linked to the executable file of the main program when the main program is running. Name this kind of linking method and give one advantage of it.

Advtanage is bringing and let the managing process becoming easier because data will trasfer to both

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2. John writes a program to assist air traffic controllers at an airport to keep track of landing flights. The order of landing is handled on a first-come, first-served basis. Each flight is identified with a flight number, e.g. **A1**. John uses an array, `F`, to store a maximum of six flight numbers.

(a) `F[i]` stores the flight number of the flight that will land in the `i`-th position. i.e. `F[1]` stores the flight number of the flight that will land next.

Suppose that initially three flights **C3**, **A1** and **B2** will be landing, as shown below:

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**C3**	**A1**	**B2**			

(i) (1) Flight **C3** has landed and flight **Z6** joins the queue for landing. Complete `F` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	**A1**	B2	Z6			

(2) Then, flight **A1** has landed and two more flights, **S19** and **T20** subsequently, join the queue for landing. Complete `F` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	B2	Z6	S19	T20		

(ii) Although the manipulation of `F` above is straightforward, it is not a good algorithm. Why not? Explain your answer briefly.

It's because the algorithm just can storage six flight data. It cannot show all the flight number in same screen. If there is lots of plane landing at the same time, this algorithm will become messy and difficult to see. (3 marks)

6

Answers written in the margins will not be marked.

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Answers written in the margins will not be marked.

Please stick the barcode lab

(b) Instead, John uses the following data structure to manipulate the order of landing. Two integer variables, `X` and `Y`, are used to hold two array indices of `F`.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	C3	A1	B2			

X= Y=

- After a flight has landed, `F[X]` will not be re-used. Then, `X` is increased by 1.
- When a flight joins the queue for landing, `Y` is increased by 1 and its flight number is assigned to `F[Y]`.

(i) What are the purposes of `X` and `Y` in the implementation of the data structure?

Don't let the number being re-used and can let user knowing how many plane to land totally

(ii) Suppose that, at the beginning flights **C3**, **A1** and **B2** are subsequently waiting for landing with `X = 1` and `Y = 3`.

(1) Flight **C3** has landed and flight **Z6** joins the queue for landing. Complete `F`, `X` and `Y` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	C3	A1	B2	Z6		

X= 2 Y= 4

(2) Then, flight **A1** has landed and two more flights, **S19** and **T20**, subsequently join the queue for landing. Complete `F`, `X` and `Y` below.

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
Flight number	C3	A1	B2	Z6	S19	T20

X= 3 Y= -6

(iii) To determine whether all waiting flights have landed, what condition should be checked?

Check (X − 1) is it the landed plane number and how many plane left

(iv) What kind of error would occur if another flight **E5** joined the queue for landing after **T20** in (b)(ii)(2)?

Runtime error

(8 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(c) John wants to develop some new systems to replace the current systems in the airport. **Tasks 1, 2** and **3** should start after having collected user requirements (**Task 0**).

Task	Weeks to complete	Description
Task 0	5	Collect user requirements.
Task 1	20	Write, test and debug **ATC** System for air traffic controllers to use.
Task 2	15	Install display panels for **FID** System as soon as the programmer starts working on **ATC** System.
Task 3	10	Write, test and debug programs for **FID** System, after **ATC** System is completed and the display panels are installed.

(i) Complete the Gantt chart for John below.

No. of weeks / Task	5	10	15	20	25	30	35	40	45	50
Task 0										
Task 1										
Task 2										
Task 3										

(ii) Which strategy of systems conversion should John use? Explain your answer briefly.

Communication with users because the system is for his customer.
If user doesn't like it, developers can make changes.

(4 marks)

Answers written in the margins will not be marked.

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Answers written in the margins will not be marked.

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You are not allowed to add any new variables when answering Question 3. If variables are added, no marks will be awarded.

3. A program is written to emulate the selection of a track in a CD player. When the player loads a CD, the total number of tracks will be read and the default track number is 1. Pressing the buttons on the player results in the following actions:

Backward	Forward
	
When this button is pressed, the previous track will be played.	When this button is pressed, the next track will be played.

You are going to write some subprograms with the following variables to emulate the selection of a track.

Variable	Description
`TrackNum`	An integer variable to store the current track number
`TrackTotal`	An integer variable to store the total number of tracks

(a) Suppose the initial track number is 1 and total number of tracks is 13. Write a subprogram or a class, `LoadInit`, to initialise `TrackNum` and `TrackTotal`, and return the two values using call by reference.

```
procedure LoadInit;
    while TrackTotal := 13 do
    writeln (TrackTotal);
    while TrackNum := 1 do
    writeln (TrackNum);
end;
```

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) Write a function, `BackTrack`, to return the track number after the 'Backward' button is pressed. If the current track number is 1, it remains unchanged. `TrackNum` should be passed to this function using call by value.

```
procedure BackTrack;
    if TrackNum >= 1 then writeln(TrackNum);
    else
    TrackNum := TrackNum - 1;
    writeln(TrackNum);
end;
```

TrackNum := TrackNum + 1

(3 marks)

(c) Write a function, `NextTrack`, to return the track number after the 'Forward' button is pressed. If the next track number exceeds the total number of tracks, the track number is set to 1. `TrackNum` and `TrackTotal` should be passed to this function using call by value.

```
procedure NextTrack;
    TrackNum := TrackNum + 1;
    if TrackTotal := TrackNum then
      TrackNum := 1
    else writeln(TrackNum);
end;
```

(2 marks)

(d) A new button, 'Shuffle', is to be emulated. When it is pressed, a track number will be randomly selected from 1 to `TrackTotal`.

A given function, `myrand`, without arguments can be called to return a random number `r`, where $0 \leq r < 1$.

Write a function, `shuffle`, to emulate the 'Shuffle' button. `TrackTotal` should be passed to `shuffle` using call by value.

```
procedure shuffle;
    for r := 1 to TrackTotal do
        TrackTotal := TrackTotal - 1
```

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(e) There should be a test plan to test the function written in Part (b). Suppose the total number of tracks is 13. For each of two different scenarios, suggest a test value and state the expected results.

(1) Test value: 5

Expected result: 4

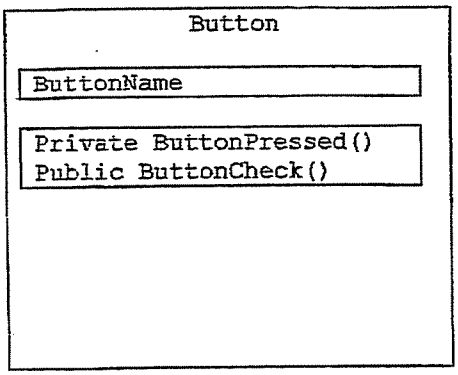
(2) Test value: 1

Expected result: 1

(2 marks)

2

(f) Suppose the program is written in an object-oriented programming language. The following *class* diagram represents button objects.



(i) How many methods are there in the class? 2

(ii) State the attribute of the class. When Button is pressed, function will start

(iii) What is the class name? Button

(3 marks)

2

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

[Java version]

Line	Content
1	`static int unitsConsumed;`
2	`static void usage(String clientNum, int curReading) throws IOException {`
3	`    boolean clientFound;`
4	`    String ClientST, accNum, accReading;`
5	`    int accValue;`
6	
7	`    BufferedReader infile = new BufferedReader(new`
8	`    FileReader("gas.txt"));`
9	`    ClientST = infile.readLine();`
10	`    clientFound = false;`
11	`    while (!clientFound) {`
12	`        accNum = ClientST.substring(0, 6);`
13	`        accReading = ClientST.substring(6, 10);`
14	`        if (clientNum.compareTo(accNum) == 0) {`
15	`            Part (a)(v)`
16	`            unitsConsumed = curReading - accValue;`
17	`            clientFound = true;`
18	`        }`
19	`        ClientST = infile.readLine();`
20	`    }`
21	`    Part (c)`
22	`}`

(a) (i) It is known that the last digit of `accNum` is a check digit. What is the purpose of this check digit?

If can be sure that accNum is not be used and fitting the clientNum

(ii) In terms of scope, what kind of variable is declared from Line 3 to Line 6?

boolean, string, integer, text

(iii) What is the purpose of `clientNum` in calculating the gas consumed?

Check that is it right Comparing to clientNum and unitsConsumed

(iv) What is the purpose of `clientFound` in calculating the gas consumed?

Check the number that is correct or incorrect.

(v) In Line 15, what operation on `accReading` should be carried out?

accReading := accNum;

(5 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) The gas meter reading of the client with the account number `678900` in the current month is `0012`.

(i) Suggest a problem that might be caused by the statement in Line 16.

The number maybe overflow and the program will become error

(ii) Insert an IF statement after Line 16 to solve this problem.

if accNum <= unitsConsumed then

(3 marks)

(c) Write a program statement in Line 21 to perform a proper file handling operation.

else clientFound := true;

(1 mark)

(d) The `while` loop might become an infinite loop.

(i) Why? That's no any limitation of number

(ii) Rewrite the first line of the `while` loop to prevent this problem.

while not clientFound := 0 do begin

(3 marks)

(e) The gas company has decided to replace the old system with a new system. A team of three members is responsible for developing the new system, as shown below:

- a project manager (PM);
- a system analyst (SA); and
- a programmer (P)

Match the major duties with the team members. The first one is an example.

Major duties	Team member
Assign resources and roles to members of the development team.	PM
Collect user requirements and write the user requirement specification.	SA
Set essential milestones of the development plan.	PM
Code the program and carry out testing.	P

(3 marks)

3

END OF PAPER

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Answers written in the margins will not be marked.

本試卷全部試題均須回答。

1. 下列算法處理整數陣列 M，其索引由 1 至 n。

步驟 1：初始化 M 每個元素的值爲其索引。
步驟 2：p ← 2
步驟 3：當 $p^2 \leq n$，執行步驟 4 至 7
步驟 4：　　q ← (n/p) 的整數部分
步驟 5：　　設 i 由 2 至 q，執行步驟 6
步驟 6：　　M[i * p] ← 0
步驟 7：　　p ← p + 1

假設 n = 16，M 的內容經步驟 1 初始化後如下所示。

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	2	3	4	5	6	7	8
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
9	10	11	12	13	14	15	16

(a) (i) 利用循環寫出步驟 1 的僞代碼。

for (i=1; i<=n; i++);

(ii) 填上步驟 3 的循環首兩遍迭代後 M 的內容。

第一遍

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
1	0	3	0	5	0	7	0
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]
9	0	11	0	13	0	15	0

第二遍

M[1]	M[2]	M[3]	M[4]	M[5]	M[6]	M[7]	M[8]
M[9]	M[10]	M[11]	M[12]	M[13]	M[14]	M[15]	M[16]

(iii) 步驟 3 的循環執行了多少次？ 3

(iv) 按序列出當步驟 3 的循環執行時所有 q 的值。

2, 3, 4

(v) 細看在 (a)(ii) M 值的樣式。這個算法有什麼用途？

(10 分)

寫於邊界以外的答案，將不予評閱。

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(b) 假設步驟 5 改動爲

設 i 由 p 至 q，執行步驟 6

這個改動對此算法有何影響？試簡略說明。

這個改動固定了 i 的範圍。

(2 分)

(c) 此算法透過一個程式編譯成爲子程式庫內的一個子程式。某主程式以這個子程式來編寫。

(i) 代碼生成器、偵錯程式、連接程式和載入程式這四類程式中，哪一類程式把這個主程式的可執行檔案放進主記憶體內執行？

連結程式

(ii) 當執行這個主程式時，這個子程式會與主程式的可執行檔案連接。試寫出此類連接方法的名稱，並舉出其中一個優點。

取決主程式同步

(3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

2. 志明編寫了一個程式，協助機場航空交通管制員記錄將要降落的航班，降落的次序是先到先處理。每一航班以其航班編號來識別，例如 **A1**。志明使用一個陣列 F 來儲存最多六個航班編號。

(a) F[i] 儲存第 i 班要降落航班的航班編號，即 F[1] 儲存下一班要降落航班的航班編號。

假設最初有三班航班 **C3**、**A1** 和 **B2** 要降落，如下所示：

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	**C3**	**A1**	**B2**			

(i) (1) 航班 **C3** 已降落，而航班 **Z6** 加入，等候降落。試完成下列 F。

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	**A1**	B2	Z6			

(2) 然後，航班 **A1** 已降落，而兩班航班 **S19** 和 **T20** 隨後依次加入，等候降落。試完成下列 F。

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	B2	Z6	S19	T20		

(ii) 雖然以上對 F 的操控簡單直接，但它不是一個好算法，爲什麼？試簡略說明。

因為他是以一個"先來先降落，後來後降落的方式進行的，如果後面的航班比原定時間早到了，也要等前面的降落後才能降落，這個操控很沒有彈性，不能容納有需要的航班插入F中。 (3 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

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(b) 志明有另一選擇，他可利用以下的數據結構操控降落的次序。整數變量 X 和 Y 是用來儲存 F 的陣列索引。

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	C3	A1	B2			

- 當一航班降落後，F[X] **不會**再被採用。之後，X 的值便增加 1。
- 當一航班加入等待降落，Y 的值便增加 1，而其航班編號會賦值至 F[Y]。

(i) X 和 Y 在實現這個數據結構時有什麼功能？

當X走了，就會把X後面的一個變為：第一個，Y增加時，就會把增加的變為最後一個。

(ii) 假設初始時航班 **C3**、**A1** 和 **B2** 依次等待降落，而 X = 1 和 Y = 3。

(1) 航班 **C3** 已降落，而航班 **Z6** 加入，等候降落。試完成下列 F、X 和 Y。

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	C3	A1	B2	Z6		

X = 2 Y = 4

(2) 然後，航班 **A1** 已降落，而兩班航班 **S19** 和 **T20** 隨後依次加入，等候降落。試完成下列 F、X 和 Y。

	F[1]	F[2]	F[3]	F[4]	F[5]	F[6]
航班編號	C3	A1	B2	Z6	S19	T20

X = 3 Y = 5

(iii) 要確定是否所有等候降落的航班都已降落，須要檢查哪一項條件？

Y是否大過X

(iv) 若在 (b)(ii)(2) 的航班 **T20** 降落後，另一航班 **E5** 加入，等候降落。這樣會出現哪類錯誤？

邏輯錯誤，F[1]沒有任何儲存的

(8 分)

寫於邊界以外的答案，將不予評閱。

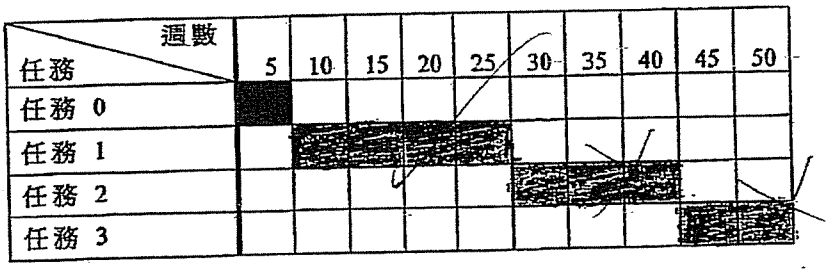
寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

(c) 志明要開發一些新系統取代機場現有的系統，完成收集用戶要求（**任務 0**）後便可開始**任務 1**、**2** 和 **3**。

任務	完成任務所須的週數	描述
任務 0	5	收集用戶要求。
任務 1	20	編寫、測試和偵錯供航空交通管制員使用的 **ATC** 系統。
任務 2	15	當程式編寫員開始編寫 **ATC** 系統，便可在接機大堂安裝 **FID** 系統顯示屏幕。
任務 3	10	完成 **ATC** 系統和安裝顯示屏幕後，便可編寫、測試和偵錯 **FID** 系統的程式。

(i) 試爲志明完成以下的甘特圖。



(ii) 志明應使用哪種系統轉換策略？試簡略說明。

直接轉換，因為志明需要完成任務0後才可進行下一個任務。

(4 分)

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

寫於邊界以外的答案，將不予評閱。

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作答第 3 題時，考生不得加入新的變量，否則不獲給分。

3. 某程式模擬在唱片播放機內的選擇曲目。此播放機載入唱片後會讀取曲目的總數，而預設的曲目編號是 1。播放機按鈕的作用如下展示。

向後	向前
	
按下此按鈕會播放上一首曲目	按下此按鈕會播放下一首曲目

考生需使用下列變量來編寫一些子程式，模擬選擇曲目。

變量	描述
TrackNum	儲存當前曲目編號整數變量
TrackTotal	儲存曲目總數整數變量

(a) 假設初始的曲目編號是 1，而曲目總數是 13。編寫子程式或類別 LoadInit 來初始化 TrackNum 和 TrackTotal，並以按址調用方式返回這兩個值。

```
TrackTotal = 13;
TrackNum = 1;
Back = TrackNum - 1;
Next = TrackNum + 1;
```

(3 分)

寫於邊界以外的答案，將不予評閱。

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(b) 編寫函數 BackTrack 返回按下「向後」按鈕後的曲目編號，若當前曲目編號是 1，則其值保持不變。TrackNum 需以按值調用方式傳遞至此函數。

```
if(TrackNum>1)
    TrackNum=TrackNum-1
else
    TrackNum=1
```

(3 分)

(c) 編寫函數 NextTrack 返回按下「向前」按鈕後的曲目編號，若下一首曲目編號超過曲目總數，則將曲目編號設定爲 1。TrackNum 和 TrackTotal 需以按值調用方式傳遞至此函數。

```
if(TrackNum<=13)
    TrackNum=TrackNum+1
else
    TrackNum=1
```

(2 分)

(d) 模擬一棵新的「隨意選擇」按鈕，使按下此按鈕後便會從曲目編號 1 至 TrackTotal 當中隨機選擇一首曲目。

已知函數 myrand 無需變元而可被調用，並返回一隨機數 r，而 $0 \le r < 1$。

試編寫函數 shuffle 模擬「隨意選擇」按鈕，而 TrackTotal 需以按值調用方式傳遞至 shuffle。

```
shuffle=r
```

(2 分)

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(e) 測試 (b) 內的函數是需要一個測試計劃。假設曲目總數是 13，提議兩種不同情境的測試值及其預期結果。

(1) 測試值： 當前曲目編號是1時再按下「向後」按鈕

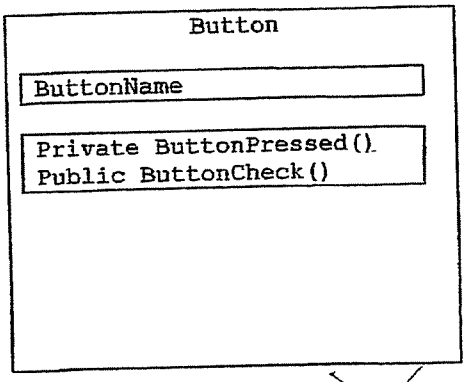
預期結果： 當前曲目編號保持

(2) 測試值： 當前曲目編號是2那時，按下「向後」按鈕

預期結果： 當前曲目編號=當前曲目編號-1

(2 分)

(f) 假設這個程式以物件導向程式語言編寫，下列的*類別*圖代表按鈕物件。



(i) 這個類別有多少個方法？ 1

(ii) 寫出這個類別的屬性。 找鈕號碼

(iii) 這個類別的名稱是什麼？ 找鈕號碼

(3 分)

寫於邊界以外的答案，將不予評閱。

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寫於邊界以外的答案，將不予評閱。

[Java 版本]

行號	內容
1	`static int unitsConsumed;`
2	`static void usage(String clientNum, int curReading) throws IOException {`
3	`    boolean clientFound;`
4	`    String ClientST, accNum, accReading;`
5	`    int accValue;`
6	
7	`    BufferedReader infile = new BufferedReader(new`
8	`    FileReader("gas.txt"));`
9	`    ClientST = infile.readLine();`
10	`    clientFound = false;`
11	`    while (!clientFound) {`
12	`        accNum = ClientST.substring(0, 6);`
13	`        accReading = ClientST.substring(6, 10);`
14	`        if (clientNum.compareTo(accNum) == 0) {`
15	`            (a)(v) 部`
16	`            unitsConsumed = curReading - accValue;`
17	`            clientFound = true;`
18	`        }`
19	`        ClientST = infile.readLine();`
20	`    }`
21	`    (c) 部`
22	`}`

(a) (i) 已知 accNum 的最後一個數位是檢查數位，這個檢查數位的功能是什麼？

(ii) 就作用域（scope）而言，在行號 3 至 6 所說明的變量是哪種變量？

(iii) clientNum 在計算煤氣用量時有什麼作用？

望上月的用量作比較。

(iv) clientFound 在計算煤氣用量時有什麼作用？

防止用量超出範圍

(v) 在行號 15 要對 accReading 進行什麼操作？

(5 分)

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寫於邊界以外的答案，將不予評閱。

(b) 客戶號碼爲 678900 的客戶在本月的煤氣錶讀數是 0012。

(i) 提出一項可由行號 16 內的語句引致的問題。

unitsConsumed 會出現負數

(ii) 寫出在行號 16 後插入的一句 IF 語句來解決此問題。

If (curReading <= accValue;)
unitsConsumed = 0;

(3 分)

(c) 寫出行號 21 的程式語句作正確的檔案處理操作。

(1 分)

(d) while 循環可能會變成一個無限循環。

(i) 爲什麼？ 可能穿出的數據 …(! clientFound)

(ii) 重寫 while 循環的第一行，以避免這個問題出現。

(3 分)

(e) 煤氣燃料公司決定以一個新系統取代舊系統，由以下三名成員組成的團隊負責開發這個新系統：

- 項目經理 (PM)
- 系統分析員 (SA)
- 程式編寫員 (P)

配對下列團隊成員的職責。第一項是例子。

主要職責	團隊成員
分配資源和角色予各開發團隊成員。	PM
收集用戶要求和撰寫用戶要求規格。	SA
制訂開發計劃內重要的里程碑。	PM
編寫程式及進行測試。	P

(3 分)

試卷完

寫於邊界以外的答案，將不予評閱。

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