Briefing Session on 2015 HKDSE ICT Exam

21/27 Nov 2015
Programme

- Introduction
- Paper 1A, Paper 1B, Paper 2B
- Break
- Paper 2C, Paper 2A, Paper 2D
- Q & A
## Breakdown of elective

<table>
<thead>
<tr>
<th></th>
<th>No. of candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6,588</td>
</tr>
<tr>
<td>2A</td>
<td>844</td>
</tr>
<tr>
<td>2B</td>
<td>241</td>
</tr>
<tr>
<td>2C</td>
<td>4,374</td>
</tr>
<tr>
<td>2D</td>
<td>1,105</td>
</tr>
</tbody>
</table>
Interesting Figures

No. of schools = 430

No. of options offered in the schools:
- One = 383
- Two = 21
- Three = 1
- Four = 0
## Results of ICT (All candidates)

<table>
<thead>
<tr>
<th>Level</th>
<th>% (2014)</th>
<th>% (2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5**</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>5*+</td>
<td>2.9</td>
<td>3.0</td>
</tr>
<tr>
<td>5+</td>
<td>7.1</td>
<td>7.5</td>
</tr>
<tr>
<td>4+</td>
<td>23.8</td>
<td>25.3</td>
</tr>
<tr>
<td>3+</td>
<td>48.8</td>
<td>50.1</td>
</tr>
<tr>
<td>2+</td>
<td>77.8</td>
<td>77.8</td>
</tr>
<tr>
<td>1+</td>
<td>93.6</td>
<td>94.0</td>
</tr>
</tbody>
</table>

**Note:**
- **L5**
  - L5**: Top 10% of L5
  - L5*: Top 40% of L5 (L5* = next 30%)
## 2015 Results (Elective Part)

<table>
<thead>
<tr>
<th>Level</th>
<th>Cumul. %</th>
<th>% at the level</th>
<th>Elective Part at the level (in terms of %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5**</td>
<td>0.7</td>
<td>0.7</td>
<td>2D &gt; 2A &gt; 2C &gt; 2B</td>
</tr>
<tr>
<td>5*</td>
<td>3.0</td>
<td>2.3</td>
<td>2D &gt; 2A &gt; 2C &gt; 2B</td>
</tr>
<tr>
<td>5</td>
<td>7.5</td>
<td>4.5</td>
<td>2D &gt; 2A &gt; 2C &gt; 2B</td>
</tr>
<tr>
<td>4</td>
<td>25.3</td>
<td>17.8</td>
<td>2D &gt; 2A &gt; 2B &gt; 2C</td>
</tr>
<tr>
<td>3</td>
<td>50.1</td>
<td>24.8</td>
<td>2C &gt; 2D &gt; 2A &gt; 2B</td>
</tr>
<tr>
<td>2</td>
<td>77.8</td>
<td>27.7</td>
<td>2B &gt; 2C &gt; 2A &gt; 2D</td>
</tr>
<tr>
<td>1</td>
<td>94.0</td>
<td>16.2</td>
<td>2B &gt; 2C &gt; 2A &gt; 2D</td>
</tr>
</tbody>
</table>
Performance – Compulsory Part

- Average no. of MC items correct = 27
- High correlation with Paper 2s and SBA
Performance – Elective Part

- Equating – performance of candidates (Elective Part) can be reflected on the same scale (Equipercentile method △)
- Performance (Paper 1) of students in 2D > 2A > 2C > 2B

△ Refer to Grading Procedures & standards-referenced Reporting in the HKDSE Exam (HKEAA)
Grading Procedures

- Sample script selection
- Standardisation
- Post-marking exercise
- Panel of judges grading meeting
- Internal meeting
- Public Exam Board meeting

Refer to Grading Procedures & standards-referenced Reporting in the HKDSE Exam (HKEAA)
SBA (1)

- 2015 Exam (new arrangement)
  - 4 assessment criteria
  - Record of assessment (various formats)
There was a serious plagiarism case involved a student who directly copied a report from another student. A zero mark was given to the SBA and a downgrade by one level in ICT was imposed on the student.
The scoring rubrics of some schools were not able to exhibit completely the assessment criteria stipulated in the SBA Teachers’ Handbook. Teachers are expected to state the assessment criteria clearly in the guidelines to their students that can demonstrate how the concepts and skills learnt will be assessed.
2015 ICT Exemplars

- Paper 1B: 2 exemplars (1 with annotated note) @ Level @ language
- Paper 2 – selected levels available
- Uploaded to www.hkeaa.edu.hk
2016 Exam - Reminders

- Compulsory Part only (e.g. Paper 1)
- Revised suggested list of Spreadsheet functions & SQL commands
- Minor changes in the curriculum (trim down)
Paper 1A
MC Statistics(1)

- Average no. of MC items correct
  - Eng = 30
  - Chi = 26
- Best five: Q.11, 12, 22, 24, 37
- Poor five: Q.3, 4, 5, 13, 19, 30
- Discrimination power:
  - High five: Q.9, 10, 14, 29, 30
  - Low five: Q.4, 6, 13, 19, 36
MC Statistics(2)

The majority choose a different answer

<table>
<thead>
<tr>
<th>Question</th>
<th>Key</th>
<th>Majority</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>28</td>
<td>D</td>
<td>B</td>
</tr>
<tr>
<td>36</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>5</td>
<td>B</td>
<td>D</td>
</tr>
</tbody>
</table>
Marking

- Quality control: standardisation, checkmarking, control scripts, etc.

Marking schemes
- Marking guidelines agreed after standardisation
- may not exhaust all possible answers
- professional discretion and judgment in accepting alternative answers (correct and well-reasoned)
Question Paper Design

- Difficulty level up to
  - Comprehensive knowledge & understanding
    - Multiple topics integrated in each question
  - Advanced skills & excellent use of software
    - Problem-based questions (e.g. spreadsheet functions)
  - Unfamiliar, complex issues
    - Q.1, 4 & 5 of Paper 1B
  - Communicate complicated ideas & solutions with coherent use of terminology
    - Demand of technical terms in answers
Marking guideline

- **Fairness**
  - Marker not do GUESS of student answer

- **Professional**
  - As students are studying ICT,
  - Answer should be more technical / professional

- **Others**
  - Not accept too general answer
  - Not accept answer seems direct copy from
Function of marking review

- Know the suggested answer
- Know the marking flexibility
- Know candidate performance
- Enhance teaching strategies
1. Ada develops a drone which is a remote control flying device. She can use a mobile device to control the drone to fly and capture videos and photos from a high place.
1B Qu 1(a) – connection method

(a) The mobile device connects to the drone through the wireless router instead of the mobile phone network.

(i) Suppose that the mobile device can connect to the drone through the mobile phone network. What is the advantage of this connection?
1B Qu 1(a) – connection method

Focus: Coverage

Accept similar description

Poor

Existing: wireless

Propose: mobile network

Problem: some wrote “access anytime anywhere”
(a) The mobile device connects to the drone through the wireless router instead of the mobile phone network.

(ii) Suppose that the wireless router is connected to the Internet. Give one advantage and one disadvantage of the connection to the Internet.
1B Qu 1a — add Internet for connection

Adv Focus:
distance between devices (router & mobile)

Not good, some simply mentioned “can connect to internet” ➔ copy question

Distance between different wireless connection method
Disadv Focus: Security

Terms related to security also accept

Not good

Open network to outside problem

1B Qu 1a — add Internet for connection
(b) The drone flies and takes videos at the same time. Distributed processing system cannot properly describe the two operations. What kind of computer system best describes the two operations? Explain your answer briefly.
1B Qu 1b – Computer Systems

Multi-tasking / real-time processing systems

For the 2nd mark: need to talk about the scenario of the questions but not simply defining the term

OK, but some simply describe what the systems wording means

Answer show to fit knowledge to question scenario
(c) When a video starts to be recorded, live video at a high resolution will be transmitted to the mobile device for recording. Give **two** design issues related to networking that Ada should consider.
1B Qu 1c – network parameters

Network bandwidth
Network security
Wireless standard
Network stability

Must talk about network

Some student talk about video attributes or device processing power

Answer should echoing the scenario of the qu
1B Qu 1(d) – Interface design

(d) The mobile device that Ada uses is a tablet computer. She develops an interface for controlling the movement of the drone and capturing videos and photos, as shown below.

(i) There are drawbacks in the design of the interface. Make two changes to improve the design and draft it below.

(ii) Describe the improvement in (d)(i) briefly.
1B Qu 1(d) – Interface design

Record a video

Take a photo
(i) And (ii) are echoing
- Button direction and location
- Merge of 2 screens

- Buttons within screen are OK except some simply rearrange button to one side only

Very flexible provide the design make sense

Need to get more experience in sensible interface design
2. A learning centre has several branches with 5,000 members. Mr Li, the manager of the learning centre, uses a table **MEM** in a database to store member information. The first five fields of **MEM** are listed below:

<table>
<thead>
<tr>
<th>Field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNO</td>
<td>Membership number</td>
</tr>
<tr>
<td>MNAME</td>
<td>Member name</td>
</tr>
<tr>
<td>TELNO</td>
<td>Telephone number</td>
</tr>
<tr>
<td>EM</td>
<td>Email address</td>
</tr>
<tr>
<td>BRANCH</td>
<td>The branch that the member joined</td>
</tr>
</tbody>
</table>
(a) (i) Explain briefly why Mr Li should not use TELNO as the primary key of MEM.
**1B Qu 2(a) – DB Primary Key**

1. Chance of Tel number may not be Unique or Null
2. Accept the using of similar wordings
3. Not accept privacy or chance of tel change
4. Know importance of uniqueness / presence to Primary key but not other issue
(a) (ii) The last digit of the membership number is a check digit. What is the use of the check digit?
Validate the digits of the membership numbers

Validate but not verify

More focus on difference between validate and verify

- Not verify
- Not simply checking
(b) Mr Li executes a SQL command on MEM with five records, as shown below. What is the output?

```sql
SELECT MNO FROM MEM WHERE BRANCH = 'WANCHAI' AND EM IS NULL
```

<table>
<thead>
<tr>
<th>MNO</th>
<th>MNAME</th>
<th>TELNO</th>
<th>EM</th>
<th>BRANCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>12342</td>
<td>Au Ka Man</td>
<td>98765432</td>
<td><a href="mailto:kmau@hklearn.com.hk">kmau@hklearn.com.hk</a></td>
<td>WANCHAI</td>
</tr>
<tr>
<td>98768</td>
<td>Fu Li Li</td>
<td>98761234</td>
<td></td>
<td>WANCHAI</td>
</tr>
<tr>
<td>10016</td>
<td>Lee Shan</td>
<td>98880001</td>
<td></td>
<td>CENTRAL</td>
</tr>
<tr>
<td>87656</td>
<td>Li Ming</td>
<td></td>
<td><a href="mailto:mli@hklearn.com.hk">mli@hklearn.com.hk</a></td>
<td>WANCHAI</td>
</tr>
<tr>
<td>78463</td>
<td>Siu Ka Ka</td>
<td></td>
<td><a href="mailto:kksiu@hklearn.com.hk">kksiu@hklearn.com.hk</a></td>
<td></td>
</tr>
</tbody>
</table>
1B Qu 2(b) – SQL Command

98768

Can locate the record but not correct output → 1 mark

Good

Interpretation of SQL command is OK for most students
(c) Mr Li wants to send members a group email with a teacher’s

(ii) Why does Mr Li enter members’ email addresses in ‘bcc’?
Email recipients do not know who will also receive this email.

Correct description is OK

Not good
- Showing students not know the use of bcc
- Not accept “Hidden email address”

Student need more experience in BCC and its use (also related to privacy)
(c) Mr Li wants to send members a group email with a teacher’s presentation file.

(ii) The size of the presentation file is 30 MB which exceeds the limit that the email server allows. Give **two** methods that Mr Li can use so that the members can receive the file through the Internet.
1B Qu 2(c) – Attachment size limit

- Break files to pieces
- Upload to FTP / Cloud
- Instant messaging / P2P

Correct description is OK

Good
- Except some said using “compression” or “change format”

Need to aware of compression and format change capability
(c) Mr Li wants to send members a group email with a teacher’s presentation file.

(iii) Mr Li stores teachers’ presentations in HTML format rather than in PPT format and designs the web site of the learning centre so that the presentations can only be shown through the web site. Give two benefits of this arrangement to the members.
1B Qu 2(c) – format for presentation

- Only browser is needed
- Cross platform

Correct description is OK

Good
Except some said using “anytime anywhere”, some mention “support to multimedia” which are not unique for HTML format

State more specific answer rather than “anytime, anywhere”, and also advantage ✈️ major difference
The following worksheet stores the estimated revenue of four branches in 2016.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Commission rate</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Branch</td>
<td>Jan-Jun (HK$)</td>
<td>Jul-Dec (HK$)</td>
<td>Commission (Branch) (HK$)</td>
</tr>
<tr>
<td>4</td>
<td>ABERDEEN</td>
<td>500,000</td>
<td>500,000</td>
<td>50,000</td>
</tr>
<tr>
<td>5</td>
<td>WANCHAI</td>
<td>540,000</td>
<td>500,000</td>
<td>52,000</td>
</tr>
<tr>
<td>6</td>
<td>SHATIN</td>
<td>600,000</td>
<td>550,000</td>
<td>57,500</td>
</tr>
<tr>
<td>7</td>
<td>JORDAN</td>
<td>580,000</td>
<td>590,000</td>
<td>58,500</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>Total commission</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>218,000</td>
</tr>
</tbody>
</table>

The commission rate for Mr Li is stored in B1. For example, the commission that Mr Li will receive from the ABERDEEN branch is B1 times the sum of B4 and C4.
(d) Mr Li enters a formula in D4 and then copies it into D5 to D7. Write down the formula in D4.
Even though there are many Excel functions in HKDSE ICT, absolute addressing and basic functions are essential.
(ii) Mr Li wants to know how to receive a total commission of $300,000. He uses the ‘what-if’ analysis in the spreadsheet to do so. List all cells that he can change.
1B Qu 2(d) – Data in Spreadsheet

B1
B4:C7

Good

Student need to care about some reference cells outside obvious range
3. John has a tablet computer with the following specifications:

1 GB main memory, 32 GB flash memory, 10” touch screen and microphone

(a) Other than using a virtual keyboard, suggest a way for John to input data without any extra device.

3. (a) voice recognition

✓ voice / speech recognition 話音 / 語音識別 / 辨認 / 辨析 / 辨識
✓ sound recognition 聲音 (聲控輸入)
✓ handwriting recognition 手寫辨認
✓ voice input 語音輸入 / handwriting input 手寫輸入
✓ barcode / QR code scanning (input certain kind of text, with built-in camera and OMR)

✗ siri / voice control / voice-to-text function
✗ microphone [hardware] / touch-screen …
Q3

(b) The tablet computer is equipped with flash memory instead of a small hard disk. Give **two** advantages of using flash memory over a hard disk.

1 mark for an answer in each category, maximum 2 categories:
(1) lower weight / smaller physical size (portability)
(2) higher data transfer rate (data transfer rate)
(3) more resistant to shock
(4) quiet in operation
(5) lower power consumption / less heat

※ capacity can be increased easily when needed
※ can be plug in to another computer easily
Q3

(c) John can install different types of word processing software in the tablet computer. Complete the following table to compare them.

<table>
<thead>
<tr>
<th>Type</th>
<th>Benefit</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shareware</td>
<td>The author usually fixes bugs in the program and adds features quickly.</td>
<td>Some advanced functions are reserved for paid version only.</td>
</tr>
<tr>
<td>Open source</td>
<td>It is free to use all its functions and users can view / adapt / change the source code when necessary.</td>
<td>Usually there is no technical support.</td>
</tr>
</tbody>
</table>

Shareware

- ✓ Try the software / function before buy
- ✓ Need to pay after trial
- ✓ Frequent update / support available
- ✓ Pop-up ad will be shown
(c) John can install different types of word processing software in the tablet computer. Complete the following table to compare them.

<table>
<thead>
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<td>It is free to use all its functions and users can view / adapt / change the source code when necessary.</td>
<td>Usually there is no technical support.</td>
</tr>
</tbody>
</table>

- **Open source software**
  - ✓ Source code available for modification
  - × User can own the source code
  - × File format may not be compatible
1st mark – what information will be disclosed / misused

✓ Personal information of John’s friends will be sold to others by that company

✗ John’s email address / account will be hacked
Q3

1st mark – The health problem

✓ Computer Vision Syndrome (vision-related injuries)
✓ Neck pain / back pain (Repetitive Strain Injury)
✗ Eyesight problem due to radiation

2nd mark – A corresponding way to minimize the problem

✓ Breaks / doing exercise in prolonged use
✓ Ergonomic devices – chair with arm rest and/or back rest, tablet holder
✗ Connect to external keyboard / mouse / monitor
✗ Do not use the tablet for a long time

(e) John must use the tablet computer for a long-period of time every day. Give a health problem he may encounter and suggest a way to minimise the problem.

(e) John may encounter a pain in his neck/ fatigue of his muscle fibres. He should take a 5-minute break after using the table computer for every 30 minutes.
Ms Wong develops a vending machine which has an embedded computer. She writes a program to control the sales of 30 kinds of products in the vending machine.

(a) (i) Other than the operating system, what will the secondary storage in the embedded computer store?

4. (a) (i) It stores the driver / program that controls the sales of the products / data of the products.
(ii) The operating system is not installed in the ROM of the embedded computer. Why not?

(ii) It is not easy to update the operating system.

- ROM is non-volatile.
- Size is small.
Advantage:
× The cost of the machine is cheaper. / The size of the machine is small.
× The setup of the machine is simpler. / The running cost is cheaper.

Disadvantage:
× Not enough money in the Octopus card
× Forget to bring the Octopus card
Ms Wong uses an array with 30 elements, $P[1], P[2], \ldots, P[30]$, to store the numbers of the 30 kinds of products remained in the vending machine. She uses the following algorithm ALG1 to check whether all the products in the machine are sold out or not.

**ALG1**

$N \leftarrow 0$

For I from 1 to 30

$N \leftarrow N + P[I]$

If $N = 0$ then

$\text{FLAG} \leftarrow \text{FALSE}$

else

$\text{FLAG} \leftarrow \text{TRUE}$

(b) (i) If the values of $P[1]$ and $P[2]$ are 0 and 1 respectively, what is the final value of $\text{FLAG}$?

(b) (i) TRUE 真

1
(ii) What does the final value of $N$ mean?

- the total number of items remained

- the total number of items
- the total number of products

- the number of products
- When $N=0$, the products in the machine are sold out.
Q4

(iii) Ms Wong chooses Boolean as the data type of FLAG. What is the major benefit of her choice?

(iii) It has only two possible values so that the program will be more readable / the control of data is more strict.

✓ 不會出現其他答案
✓ 沒有多餘的結果
✗ Save storage space
(c) (i) According to the values of \( I \) and \( \text{FLAG} \), complete the following truth table.

<table>
<thead>
<tr>
<th>( I )</th>
<th>( \text{FLAG} )</th>
<th>((I \leq 30) \text{ AND } (\text{NOT FLAG}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
<tr>
<td>15</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>30</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
<tr>
<td>31</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
</tbody>
</table>

1 \times 3
(ii) The following algorithm ALG2 performs the same task as ALG1.

\[
\text{ALG2} \\
\text{FLAG} \leftarrow \text{FALSE} \\
I \leftarrow 1 \\
\text{While} \ (I \leq 30) \ \text{AND} \ (\text{NOT FLAG}) \ \text{do} \\
\quad \text{IF} \ P[I] > 0 \ \text{THEN} \\
\quad \quad \text{FLAG} \leftarrow \text{TRUE} \\
\quad I \leftarrow I + 1
\]

Which algorithm, ALG1 or ALG2, should Ms. Wong use? Explain briefly.

(ii) ALG2 – It generates a fewer number of iterations / fewer variable / average speed is faster.
ALG1 – It may have fewer conditional statements.

ALG2
× Run faster / More accurate / Fewer comparison

ALG1
× Logic is simple / Program is shorter / Fewer comparison
× Total number of items is found
Amy, Billy and Charles work in a company offering online cooking classes. Read their conversation and answer the questions below.

Amy: Charles, I read an e-commerce book and I don’t understand these terms: IP, HTTP, POP, FTP, IMAP and SMTP.

Charles: They are all protocols used in the Internet.

(a) (i) Give two examples of e-commerce that could be carried out in the company.

5. (a) (i) Online shopping web sites for selling cooking recipe/cooking ingredient (online payment)
   - example of Group buying (collective buying) can be accepted as online payment
   Online cooking classes (video) for registered customers (online registration)
   Sending cooking courses information to prospective and established customers by e-mail (online advertising)
   Providing online assistant (by IM/VC/Social Networking/Forum/Email) to reply the enquiry from customers (online assistant)

1 mark for appropriate e-commerce example
1 mark for appropriate scenario (company offering online cooking class)

× Buying cooking books / Paying the course fee
× (online is not mentioned)
Q5

(ii) Match the appropriate protocols with the Internet activities below.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Browse <a href="http://www.gov.hk">www.gov.hk</a></td>
<td>IP, _____________</td>
</tr>
<tr>
<td>(2) Send and receive web mail</td>
<td>IP, _____________, _____________</td>
</tr>
</tbody>
</table>

For (2)
- IMAP, POP
- (used for downloading emails to Mail Client Program, e.g. outlook)

Source: [http://amar-linux.blogspot.hk/2014/09/how-mail-server-works.html](http://amar-linux.blogspot.hk/2014/09/how-mail-server-works.html)
End client computer can begin playing the media before the entire file has been transmitted.

As the computer plays the media file, it continues to download and buffer additional content from the streaming server. Playing and downloading happen at the same time.

The media data will be discarded after playing to the user.

The streamed files play over the Internet without being downloaded to viewers' computers.
Q5

(ii) What is the major difference between video conferencing and webcasting?

- Video conferencing usually involves a small number of parties (e.g., two), while webcasting involves many simultaneous listeners/viewers.

✓ Video conferencing involves two-way communication (interaction) while webcasting is one-way content delivery.
✓ Video conferencing involves real-time communication while webcasting can be real time or recorded content.

✗ VC: authorized user can join; WC: anyone can join
(c) Give two considerations for developing the plug-in.

Need to support different kinds of browsers.
Some operating systems do not allow users to install third party plug-ins.
Need to support various versions of browsers.

* file size of the plug-in
Charles: Billy, I use AVI and MP4 formats to store your cooking shows in a file server.

Billy: I find it difficult to locate a particular video in the file server.

(d) (i) Give one benefit of using each of the following file formats for the videos.

(1) AVI

(2) MP4

(d) (i) (1) AVI: It can have a better quality. 
(2) MP4: It has a smaller file size.

- AVI: supported by many player / cross-platform
- AVI: higher resolution
Q5

(ii) Suggest two ways for Charles to support searching for videos efficiently.

- Set keyword to the video
- Use keyword to search (not mentioned to set the keyword)
Summary of teaching strategies

- more specific answer rather than “anytime, anywhere”

Answer
- show to fit knowledge to question scenario
- should echoing the scenario of the qu

Need to get more experience in sensible interface design

Know importance of uniqueness / presence to Primary key
Summary of teaching strategies

- More focus on difference between validate and verify
- Interpretation of SQL command is OK for most students
- More experience in BCC and its use (also related to privacy)
- Aware of compression and format change capability
Summary of teaching strategies

Spreadsheet

- absolute addressing and basic functions are essential
- care about some reference cells outside obvious range
HKDSE ICT 2015

Paper 2A review
1. An athletic club is organising a running competition. Three database tables PAR, EVE and RES are used to store information relating to the competition.

**PAR**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID</td>
<td>Identity code of the participant</td>
<td>F0023</td>
</tr>
<tr>
<td>PNAME</td>
<td>Name in English</td>
<td>Susan Li</td>
</tr>
<tr>
<td>GENDER</td>
<td>Gender of the participant (F – female; M – male)</td>
<td>F</td>
</tr>
<tr>
<td>AGE</td>
<td>Age</td>
<td>18</td>
</tr>
</tbody>
</table>

**EVE**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>EID</td>
<td>Identity code of the event</td>
<td>E08</td>
</tr>
<tr>
<td>DIS</td>
<td>Race distance in metres</td>
<td>1500</td>
</tr>
<tr>
<td>GENDER</td>
<td>Gender of the participant (F – female; M – male)</td>
<td>F</td>
</tr>
<tr>
<td>MAXA</td>
<td>Maximum age of the participant</td>
<td>24</td>
</tr>
<tr>
<td>MINA</td>
<td>Minimum age of the participant</td>
<td>16</td>
</tr>
<tr>
<td>QUOTA</td>
<td>The quota for the event</td>
<td>30</td>
</tr>
</tbody>
</table>

**RES**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID</td>
<td>Identity code of the participant</td>
<td>F0023</td>
</tr>
<tr>
<td>EID</td>
<td>Identity code of the event</td>
<td>E08</td>
</tr>
<tr>
<td>TIME</td>
<td>Result in seconds</td>
<td>301.50</td>
</tr>
</tbody>
</table>
Q1

(a) The identity code for Susan is ‘F0023’. List the race distances of the events that Susan has completed.

(b) The age limits of events are stored in MAXA and MINA of EVE. A female participant is 20 years old. List the race distances of the events that this female participant can take part in.

(c) Give the maximum number of female participants in the competition.

(d) For some race distances, the athletic club does not arrange events for female participants to take part in. List the race distances of these events and the corresponding numbers of events.

Candidate Performance:
(a) Very Good. (b) Satisfactory. (c) Satisfactory (d) Fair.

Most candidates are able to manage simple SQL statements involving joining tables, filtering and grouping.

(c) Misunderstand the meaning of “event”. Wrongly use ‘MAX‘ instead of ‘SUM’

(d) Wrongly use ‘<>’ to join the table instead of ‘not in (subquery)’
Q1

(e) What is the purpose of the following SQL command?

```
SELECT DISTINCT P1.PNAME
FROM RES R1, PAR P1
WHERE R1.PID = P1.PID AND
  EXISTS
    (SELECT R2.EID
     FROM RES R2
     WHERE R1.EID = R2.EID
     GROUP BY R2.EID
     HAVING R1.TIME = MIN(R2.TIME))
```

Candidate Performance:
(e) Fair.
(e) Some candidates don’t know the usage of EXISTS” in the query
Mr Lee develops an online shopping system for a company so that members can buy its products online. He designs the following database tables for the system.

**MEM**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MID</td>
<td>Identity code of the member</td>
</tr>
<tr>
<td>MNAME</td>
<td>Member name</td>
</tr>
</tbody>
</table>

**PROD**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID</td>
<td>Identity code of the product</td>
</tr>
<tr>
<td>PNAME</td>
<td>Product name</td>
</tr>
<tr>
<td>UPRICE</td>
<td>Unit price</td>
</tr>
<tr>
<td>WID1</td>
<td>Identity code of Warehouse 1</td>
</tr>
<tr>
<td>ADDR1</td>
<td>Address of Warehouse 1</td>
</tr>
<tr>
<td>WNAME1</td>
<td>Name of Warehouse 1</td>
</tr>
<tr>
<td>STOCK1</td>
<td>Number of the products in the Warehouse 1</td>
</tr>
<tr>
<td>WID2</td>
<td>Identity code of Warehouse 2</td>
</tr>
<tr>
<td>ADDR2</td>
<td>Address of Warehouse 2</td>
</tr>
<tr>
<td>WNAME2</td>
<td>Name of Warehouse 2</td>
</tr>
<tr>
<td>STOCK2</td>
<td>Number of the products in the Warehouse 2</td>
</tr>
</tbody>
</table>

**TRAN**

<table>
<thead>
<tr>
<th>Field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TID</td>
<td>Identity code of the transaction</td>
</tr>
<tr>
<td>MID</td>
<td>Identity code of the member</td>
</tr>
<tr>
<td>PID</td>
<td>Identity code of the product</td>
</tr>
<tr>
<td>QUAN</td>
<td>Quantity of the product purchased</td>
</tr>
<tr>
<td>PDATE</td>
<td>Date and time of the transaction</td>
</tr>
</tbody>
</table>
Q2

(a) Mr Lee creates TRAN by using the following SQL command.

```
CREATE TABLE TRAN (  
    TID char(10) not null,  
    MID char(10) not null,  
    PID char(10) not null,  
    QUAN int not null,  
    PDATE date not null  
)
```

(i) What is the meaning of ‘not null’ in the command?
(ii) Other than ‘not null’, give another type of constraint that can be added to the command.

Candidate Performance:
(a)(i) Very Good. (a)(ii) Very Good.
(b) Draft an ER diagram for the database design. It is not necessary to draw attributes in the diagram.

(c) (i) Mr Lee creates a view `FIND_VIP` to find members who have transactions in which the total spending is greater than $10,000. Complete `FIND_VIP` below.

```
CREATE VIEW FIND_VIP AS

SELECT __________________________

FROM __________________________

WHERE __________________________
```

Candidate Performance:
(b) Good. (c)(i) Fair.

(b) 4 marks out of 5.

(c) (i) Some candidates only know how to use "INNER JOIN", but don’t know how to join table by using WHERE clause
Q2

(ii) Mr Lee creates views for data extraction. Give two benefits of using views.

(d) The company has several warehouses. Each product will be stored in no more than two warehouses.

(i) Give two issues with storing product data in PROD.

Candidate Performance:
(c)(ii) Fair. (d) Satisfactory.

(c)(ii) Many candidates can only give one correct benefit
Question 2

(ii) Mr Lee uses three database tables PRODUCT, WAREHOUSE and STOCK to replace PROD so as to solve the issues in (d)(i). Complete the database schema of the three tables below and give the description of new field names.

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRODUCT</td>
<td>(description)</td>
</tr>
<tr>
<td>Primary key:</td>
<td>(key)</td>
</tr>
<tr>
<td>WAREHOUSE</td>
<td>(description)</td>
</tr>
<tr>
<td>Primary key:</td>
<td>(key)</td>
</tr>
<tr>
<td>STOCK</td>
<td>(description)</td>
</tr>
<tr>
<td>Primary key:</td>
<td>(key)</td>
</tr>
</tbody>
</table>

Candidate Performance:
(d)(i) Satisfactory.

- Many candidates try to describe the usage of the new table, but not new field names.

- Many candidates do not think WID, WNAME, ADDR and STOCK are new fields, since there are WID1, WNAME1, ADDR1 and STOCK1 in the original table.
ABC company has many supermarkets in Asia. In the 1980s, ABC company computerised its business operations by introducing a database management system (DBMS).

(a) The DBMS adopted a hierarchical model for storing the following information.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BID</td>
<td>Branch code</td>
</tr>
<tr>
<td>BNAME</td>
<td>Branch name</td>
</tr>
<tr>
<td>CC</td>
<td>City code</td>
</tr>
<tr>
<td>CITY</td>
<td>City name</td>
</tr>
<tr>
<td>CID</td>
<td>Identity code of the customer</td>
</tr>
<tr>
<td>CNAME</td>
<td>Customer name</td>
</tr>
<tr>
<td>PID</td>
<td>Identity code of the product</td>
</tr>
<tr>
<td>PNAME</td>
<td>Product name</td>
</tr>
</tbody>
</table>

Complete the logical data representation of the hierarchical model below.
Candidate Performance:
(a) Excellent
ABC company revamps the DBMS to keep up with operational needs. It uses the following database tables CUST, PROD and TRAN to store information on customers, products and transactions respectively.

### CUST

<table>
<thead>
<tr>
<th>Field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CID</td>
<td>Identity code of the customer</td>
</tr>
<tr>
<td>CNAME</td>
<td>Customer name</td>
</tr>
<tr>
<td>BAL</td>
<td>Account balance</td>
</tr>
</tbody>
</table>

### PROD

<table>
<thead>
<tr>
<th>Field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID</td>
<td>Identity code of the product</td>
</tr>
<tr>
<td>PNAME</td>
<td>Product name</td>
</tr>
<tr>
<td>SPRICE</td>
<td>Selling price</td>
</tr>
</tbody>
</table>

### TRAN

<table>
<thead>
<tr>
<th>Field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TID</td>
<td>Identity code of the transaction</td>
</tr>
<tr>
<td>CID</td>
<td>Identity code of the customer</td>
</tr>
<tr>
<td>PID</td>
<td>Identity code of the product</td>
</tr>
<tr>
<td>QUAN</td>
<td>Quantity of the product purchased</td>
</tr>
</tbody>
</table>
(b) Identify the primary keys and foreign keys for PROD and TRAN if any.

<table>
<thead>
<tr>
<th>Primary key</th>
<th>Foreign key</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROD</td>
<td></td>
</tr>
<tr>
<td>TRAN</td>
<td></td>
</tr>
</tbody>
</table>

Candidate Performance :  
(b) Very Good.

Only a few candidates wrongly think that the foreign key is in the table PROD.
Q3

(c) ABC company pays a lot of money annually for the use of the DBMS. Although free hierarchical DBMS is available, it decides to keep using the current commercial relational DBMS. Give four reasons to support this decision.

Candidate Performance:
(c) Poor.

Many candidates don’t know there are two comparisons in the question.
- “free” vs “commercial”
- “hierarchical” vs “relational”
Q3

(d) (i) Indexing can improve query performance. What is the drawback of using an index?
(ii) In the table CUST, an index on CID is created.

(1) The performance of the following SQL command does not improve much with the index. Why not?

```
SELECT SUM(BAL) FROM CUST
```

(2) Give a SQL command that uses the index to improve the query performance.

Candidate Performance:
(d) Fair.

- Many candidates don’t know the drawback of using index
- Many candidates don’t clear know the operation of indexing and leave d(ii)(2) blank
Mr Ng is a project manager in an IT company. He plans to develop a mobile application about air quality. He collects and stores the Air Quality Health Index (AQHI) readings in 2014, as shown below.

<table>
<thead>
<tr>
<th>District</th>
<th>Date &amp; time</th>
<th>0:00 1.1.2014</th>
<th>1:00 1.1.2014</th>
<th>...</th>
<th>14:00 5.1.2014</th>
<th>...</th>
<th>23:00 31.12.2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Kwun Tong</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Tap Mun</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Mr Ng uses Computer Aided Software Engineering (CASE) tools to develop the mobile application.
Q4

(i) For each of the following CASE tools, give a major deliverable that Mr Ng will produce.

<table>
<thead>
<tr>
<th>CASE tool</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Query editor</td>
<td></td>
</tr>
<tr>
<td>Graphical modelling tool</td>
<td></td>
</tr>
<tr>
<td>Project management tool</td>
<td></td>
</tr>
</tbody>
</table>

(ii) Mr Ng wants to set up a central repository that contains information for the CASE tools to use. Give two examples of the information.

Candidate Performance:
(a) Very Poor.

Most candidates don’t know what is CASE tools.
(b) Mr Ng will go through the following eight stages in the development life cycle.

1. Requirements collection and analysis
2. System definition
3. Application and database design
4. Prototyping
5. Data migration
6. Form and report design
7. Testing
8. Operational maintenance

Mr Ng will perform the following tasks. Match the appropriate stage with each task.

(i) Find any program bugs before launching the application. __________

(ii) Draw ER diagrams. __________

(iii) Launch a bug-fix version of the application. __________

(iv) Develop a trial version for demonstration. __________

(v) Ask users about their needs. __________

Candidate Performance:
(b) Very Good.
Question 4

(c) (i) Give one example of the summary information that Mr Ng can generate from the data of the 2014 AQHI.

(ii) Mr Ng applies data mining technology to discover some patterns in the data. Give two examples of the different kinds of patterns, such as trends in the AQHI.

(d) The IT company requires Mr Ng to observe ethical practices when developing this mobile application. Give two examples of the ethical practices.

Candidate Performance:
(c) Satisfactory. (d) Satisfactory.

(c) (i) should concentrate on the word “summary”

(c)(ii) should concentrate on the word “patterns”

(d) Many candidates don’t know the meaning of “ethical practices”
HKDSE ICT 2015

Paper 2B review
Marking guideline

- Fairness
  - Marker not do GUESS of student answer

- Professional
  - As students are studying ICT,
  - Answer should be more technical / professional

- Others
  - Not accept too general answer
  - Not accept answer seems direct copy from qu
Function of marking review

- Know the suggested answer
- Know the marking flexibility
- Know candidate performance
- Enhance teaching strategies
1. Bill wants to set up a wired network with a router at home. The back of the router is shown below.
(a) Which ports in the router should the following items connect to?

- A desktop computer ➔ LAN
- A network printer
- An Ethernet port connected to the Internet
- A NAS device
Excellent

Practical experience is important
(b) Bill wants to connect a computer in his office to a desktop computer at home via a virtual private network.

(i) Do you think Bill needs to configure WPA2 in his router at home for security reasons? Explain briefly.
2B Qu 1(b) – WPA vs connection

Open-ended

No ↔ wired

Yes ↔ wireless security

Poor

Many students simply said can increase security or explain what is VPN

Open-ended

Care about question scenario
(b) Bill wants to connect a computer in his office to a desktop computer at home via a virtual private network.

(ii) How does the virtual private network improve the network security?
2B Qu 1(b) – VPN operation

Apply IPSec to **authenticate** & **encrypt** data packets

Keyword: authenticate & encrypt

Poor
Many students simply mentioned “Private”, “Tunnel”, “login” etc

Some of the keywords in ICT is unavoidable to remember
(c) In Bill's office, he has a printer equipped with 32MB RAM and a computer network of several desktop computers. He wants to set up a network printer using one of the following methods:

- Method 1: Connect the printer to a router.
- Method 2: Connect the printer to a desktop computer

(i) Give one advantage of Method 1 over Method 2
2B Qu 1(c) – printer in network

1 over 2: Not rely on any computer
2 over 1: Better control of printing

Accept similar wordings

Poor
Many student mention the printing time which is not main concern or obvious

Need to know the main concern and answers’ priority
(d) When Bill prints a document file, the printer will receive a number of data packets.

(i) What does a data packet contain? Give two examples.
2B Qu 1(d) – Data packet detail

Header or info in Header
Footer or info in footer
A segment of printing data

Accept if cannot wrote out header but info in header, apply also for footer

Good
Except some students wrote source address, dest address ⇒ 1

Give two examples ⇒ two distinct examples
(d) When Bill prints a document file, the printer will receive a number of data packets.

(ii) Suggest and describe a mechanism for managing the data transfer.
2B Qu 1(d) – transfer mechanism

Data store in buffer
The reassemble

Accept similar wordings

Poor
Most students not know what “mechanism” means, and also not good at writing description

Do more practice on mechanism description
(e) During the printing, the printer may send some messages such as "Out of paper".

(i) Is the data communication mode during the printing simplex or duplex? Explain briefly.
2B Qu 1(d) – transfer mechanism

Duplex with suitable explanation

Accept similar wordings

Good
Most students know the concept of simplex and duplex and can explain well

More practical scenario link up to theory during practice
(e) During the printing, the printer may send some messages such as "Out of paper".

(ii) In this network, CSMA/CD is used to coordinate the data transmission. When data retransmission takes place, why is there a random period of waiting time?
To avoid collision again

Accept similar wordings

Good
Most students know the rationale behind random re-transmission time

Even the term CSMA/CD seems difficult, close look of question is OK
2. Mr Lau manages a serviced office. He designs a system with a virtual desktop infrastructure (VDI) for renters of the office such that the desktop environment and application software are stored in a remote server and can be used in any workstation in the network, as shown below.

```
    Remote server  Switch
      |            |   
      |            |   
      |            |   workstations
      |            |
      |            |
```
(a) Mr. Lau's design is a client-server system

(i) Give two characteristics of the design
2B Qu 2(a) – Network model

- Higher security
- Better control
- Dedicated server

Need to use “comparatives” in answer

Good
Except some students simply wrote “security”, “with server”

Characteristics = adv / diff over the opposite model
(a) Mr. Lau's design is a client-server system

(ii) Other than the network bandwidth, give two factors that will affect the performance of the system in the design.
2B Qu 2(a) – network performance

Server capability
Number of users
Network cable / device capability

Device + descriptive attribute

Factor = has descriptive attribute

Good
Except some students simply wrote “user”, “switch”
(b) Under the VDI, the estimated network usage of three types of renters is:

<table>
<thead>
<tr>
<th>Type of renter</th>
<th>Application</th>
<th>Bandwidth per renter</th>
<th>Rent per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal consultant</td>
<td>Office applications</td>
<td>50 kbps</td>
<td>$100</td>
</tr>
<tr>
<td>Wedding planner</td>
<td>Video conferencing</td>
<td>200 kbps</td>
<td>$500</td>
</tr>
<tr>
<td>Designer</td>
<td>Multimedia production</td>
<td>600 kbps</td>
<td>$800</td>
</tr>
</tbody>
</table>

(i) In which of the following scenarios will the office receive a higher daily rent? Show your calculation.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Number of renters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Legal consultant</td>
</tr>
<tr>
<td>A</td>
<td>20</td>
</tr>
<tr>
<td>B</td>
<td>20</td>
</tr>
</tbody>
</table>
2B Qu 2(b) – bandwidth calculation

A is higher with correct calculation

Excellent

Bring calculator!
The maximun system throughput is 12Mbps. Briefly explain whether the serviced office can support scenarios A and B. Show your calculation.
2B Qu 2(b) – bandwidth calculation

It can support both scenarios /
it cannot support both scenario at the same time

Simply calculation is not enough, need to have summary answer

Excellent

Bring calculator!
(c) Renters can access the system through the Internet outside the office.

(i) Suggest an effective measure Mr Lau can use to improve network security and describe it briefly.
Antivirus software / firewall + description

Acceptable
Some students simply wrote VPN, SSL, PKI, encrypt which are not protecting the system but protecting the transmission only

Accept similar wordings and meaningful description

Take care of question focus
(c) Renters can access the system through the Internet outside the office.

(ii) Mr Lau realises that the network might have experienced a Denial of Service (DoS) attack. How does a DoS attack affect the system?
2B Qu 2(c) – Security ~ DoS

Acceptable
Most student can get one mark but cannot get both as cannot wrote out both key message

Accept similar wordings and meaningful description

numerous communications
cannot respond to normal requests

Take care of marks vs number of key messages
(d) Mr Lau wants to install an uninterruptible power supply (UPS) for the system.

(i) In the system, which device should have highest priority for connecting to the UPS?
Remote server (server)

Not accept any other devices

Acceptable
Some of the students wrote backup server which is not in the question

Answer need to echo question requirement
2B Qu 2(d) – When UPS triggers on

(d) Mr Lau wants to install an uninterruptible power supply (UPS) for the system.

(ii) Give two major tasks that the device in (d)(i) may need to do immediately when the electricity cuts off.
2B Qu 2(d) – When UPS triggers on

Sync / backup data

Notify user

Acceptable

Most students can wrote “backup” but few can wrote “notify users”

Accept some other reasonable answer

Can VM help ???
3. Paul is a network engineer and Ada is a technician. They are going to set up a computer network for visitors and staff in a library.

(a) Ada suggests that a **wired network instead of a wireless network** be provided for visitors.

(i) Give **two** advantages of Ada’s suggestion for visitors.

(ii) Paul decides to install **only a wireless network** for the visitors. Give **two** reasons to support his decision.
(b) The network allows visitors to access electronic materials in the library. Hence, Paul decides to install a proxy server. Briefly describe the purpose of installing the proxy server.
Q3

Paul divides the network into a staff zone and a visitor zone. Visitors’ mobile devices and staff computers can only communicate within their zones and access the Internet. $m$ and $n$ are positive integers less than 250.

Visitor Zone

Staff Zone

(c) Paul worries that some visitors in the visitor zone may hack the computers in the staff zone. He suggests installing a firewall to enhance the network security.

(i) *Suggest a suitable location for installing the firewall.* Use ‘F’ to label the location in the diagram above.

(ii) *Describe two ways in which a firewall can enhance the network security.*

Two possible locations
Q3

(d) (i) If the subnet mask for the network is set as 255.255.254.0, will the network work properly? Explain briefly.

The network still works properly because the zones are still in different subnets.

(ii) Give the IP address of a proper gateway for Computer 1 in the staff zone.

192.168.2.254
Q3

(e) Ada sets up all access points using the default SSID.

(i) Paul suggests that Ada use another SSID. Give a reason to support his suggestion.

Visitors cannot identify the network of the library without confusion.

(ii) How does roaming take place with the access points using the same SSID?

Visitors’ mobile devices can detect and connect to the access point with the strongest available signal under the same SSID.
(iii) Ada drafts some terms for visitors to accept when they first log on the network.

Library Network

Terms:

Accept  Decline

Give two examples of suitable terms.

(iii) Examples: (Restrictions on use / restriction of liability / personal data)
Producing excessive network traffic such as sending massive emails is prohibited.
The library will not be liable for any damages or injury caused by the use of the network.
Personal data sent through the network may be stored by the ISP.
Mary is a project manager. She works on a project about setting up a new computer network for a company, as shown below.

(a) Briefly describe the use of the switches and the router in the network.

Switches: ________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

Router: __________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

(2 marks)
(b) Mary considers using Cloud storage instead of the file server. What is the advantage and disadvantage of Cloud storage for the network?

Advantage: 

Disadvantage: 

(2 marks)
Q4

(c) (i) Mary drafts a test plan to validate the network. Briefly describe two test items in the test plan.

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

(ii) Mary has to do documentation for the technical staff. Give two important content items in the documents.

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

(4 marks)
Mary can use the following command ‘CR’ to set the permissions of a folder in the file server and its subfolders will then have the same permissions.

Example 1:  
```
CR g=r \usr\tmp1
```
Example 2:  
```
CR o=rwx, g=rw \usr\tmp2
```

<table>
<thead>
<tr>
<th>Character</th>
<th>Stand for</th>
<th>Character</th>
<th>Stand for</th>
</tr>
</thead>
<tbody>
<tr>
<td>g</td>
<td>guests</td>
<td>r</td>
<td>read</td>
</tr>
<tr>
<td>o</td>
<td>folder owner</td>
<td>w</td>
<td>write</td>
</tr>
<tr>
<td>=</td>
<td>permission grant</td>
<td>x</td>
<td>execute</td>
</tr>
</tbody>
</table>

In example 1, the permission of `\usr\tmp1` for the guests is `read` only.

In example 2, the permissions of `\usr\tmp2` for the folder owner are `read`, `write` and `execute` while those for the guests are `read` and `write`. 
<table>
<thead>
<tr>
<th>Line</th>
<th>Command</th>
<th>File Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CR o=rw</td>
<td>\usr\policy</td>
</tr>
<tr>
<td>2</td>
<td>CR o=r, g=r</td>
<td>\usr\policy</td>
</tr>
<tr>
<td>3</td>
<td>CR o=r, g=rw</td>
<td>\usr\reports</td>
</tr>
<tr>
<td>4</td>
<td>CR g=r</td>
<td>\usr\reports</td>
</tr>
<tr>
<td>5</td>
<td>CR o=r, g=r</td>
<td>\usr</td>
</tr>
</tbody>
</table>

(d) Mary plans to grant folder owners the *read* and *write* permissions and guests the *read* permission on \usr\policy and \usr\reports. She enters the following commands in sequence.

(i) After executing the 1st and 2nd commands, what are the permissions of \usr\policy?

(d)(i) Folder owners and guests have the *read* permission.

(ii) After executing the 3rd and 4th commands, what are the permissions of \usr\reports?

(ii) Folder owners have the *read* and *write* permissions and guests have the *read* permission.

(iii) Will the final result be appropriate? Explain briefly.

(iii) No, folder owners and guests have the *read* permission only.

(iv) Rewrite the commands so that Mary can set the folder permissions efficiently.

(iv) CR o=r, g=r \usr\reports
    CR o=rw, g=r \usr\policy
    CR o=rw, g=r \usr\reports
Summary of teaching strategies

- Practical experience is important
- Care about question scenario
- Some of the keywords in ICT is unavoidable to remember
- Need to know the main concern and answers’ priority
  - Give two examples ==> two distinct examples
Summary of teaching strategies

- Do more practice on mechanism description
- More practical scenario link up to theory during practice
- Even the term CSMA/CD seems difficult, close look of question is OK
- Characteristics = adv / diff over the opposite model
Summary of teaching strategies

- Factor = has descriptive attribute
- Bring calculator!
- Take care of question focus
- Take care of marks vs number of key messages
- Answer need to echo question requirement
- Can VM help???
HKDSE ICT 2015

Paper 2C review
何先生是 ABC 中學的技術員。他使用一個記錄系統儲存校長的演講。該系統儲存音效檔案時，使用了格式 P，其屬性如下：

| 取樣頻率： | 22.05 kHz |
| 取樣大小： | 16 位元 |
| 頻道數量： | 2 |
| 數據壓縮比： | 10:1 |

(a) 試估算一分鐘演講的檔案大小，並以 MB 為單位。

0.50 ~ 0.53 (2)
只有公式
\[(16 \times 2 \times 22.05 \times 1000 \times 60) / (10 \times 8 \times 1024 \times 1024)\]
(1)
\[(16 \times 2 \times 22 \times 1000 \times 60) / (10 \times 8 \times 1024 \times 1024) = 0.50354\]
\[(16 \times 2 \times 22.05 \times 1000 \times 60) / (10 \times 8 \times 1024 \times 1024) = 0.504864\]
\[(16 \times 2 \times 22 \times 1000 \times 60) / (10 \times 8 \times 1000 \times 1000) = 0.528\]
\[(16 \times 2 \times 22.05 \times 1000 \times 60) / (10 \times 8 \times 1000 \times 1000) = 0.5292\]

考生能寫出公式估算音頻檔案的大小。
少數考生有留意數據壓縮比，並正確地完成運算
No of samples collected in each second is more (1) so that the sound quality is better.

Human beings are not easily aware (1) of the increase of audio data with sampling rate greater than 44.1 kHz.
He can use *fade in, fade out* / *淡入淡出* (1) effect such that
the volume of the speech will gradually decrease
while the volume of the school song will gradually
increase. (1)

只描述一邊也可以，考生未能適切地將他們所描述的效果命名。但如果次序錯了就不可以接受。
方法2：

- 演講
  8分鐘
- 校歌
  5分鐘

→

Y
8分鐘

(ii) 當製作Y時，校歌會被嵌入成為演講的背景音樂。何先生應該考慮這些音效檔案的什麼屬性？試舉出兩個例子。

amplitude / loop / length of the files / loudness / volume

× Size / channels / format / 内容 / 氣氛

大概三分之一的考生能寫出兩個音頻檔的屬性，其他部分考生未能正確地寫出「振幅」這個重要的名稱。
校長希望將系統升級，以串流技術進行視像廣播。何先生將視像設為 MPEG 格式，其傳輸位元率是 450 Kbps。

(d) (i) 在開始播放一條視像影片前，須首先下載 2 MB 數據。試估算播放此視像影片前的等待時間。

只有公式

$$\frac{(2 \times 8 \times 1000 \times 1000)}{(450 \times 1000)} = 35.6 \text{ s} = 0.59 \text{ min}$$

$$\frac{(2 \times 8 \times 1024 \times 1024)}{(450 \times 1000)} = 37.3 \text{ s} = 0.62 \text{ min}$$

(2 x 8 x 1024 x 1024) / (450 x 1000) = 37.3s = 0.62 min

(2 x 8 x 1000 x 1000) / (450 x 1000) = 35.6s = 0.59 min

只有公式 2MB / 450Kbps 或正確拆解 (1)

× 2 / 450、2MB / 450 ……

(ii) 校長覺得等待時間太長。試建議如何調整一項視像屬性來縮短等待時間。

Reduce frame rate/resolution / bit rate 位元率
Increase compression ratio
Change to format with smaller file size (1)

× Streaming

令人滿意
GIF is lossless compression / transparent background / smaller file size / animated /
適用於以文字為主的圖形和有清晰邊緣的線圖 (1)

× download faster / display faster

The greatest colour depth of PNG format is larger than that of GIF format.
a variety of transparency (1)
(iii) 用戶可選擇網頁的背景顏色。當用戶再次瀏覽該網頁時，上次所選擇的背景顏色會自動被採用。這樣涉及了什麼網頁設計技術？試簡略描述這項技術。

曲奇/小甜餅/cookie/cookies/(1)
The background colour of the web page/browser setting/用戶喜好 is saved (1)

server-side scripts (1)
user profile is saved on the server ..... (1)

雖能寫出「cookies」，但描述背後所採用的技巧時顯得困難。
2. 小娟在某網站註冊了一個免費電郵帳戶。註冊頁如下展示：

+-----------------+----------------------+
| 帳戶名稱： | edaho               |
| 密碼：     | 123                 |
| 確認密碼： |                     |
+-----------------+----------------------+

(a) (i) 當小娟輸入帳戶名稱「edaho」時，信息「已被使用」便出現了。試描述這網站如何產生這個信息。

Server-side scripting (1) is used to check whether the username has been used in the database. (1)
Client-side scripting (1) is used to validate the password (1).

Most of the error explanations are about password strength, they are just restating the rules in the table.

Ensure user types the password twice. (1)
(b) 註冊頁的 HTML 碼在不同部分包含超連結、樣式頁面和元數據，如下展示：

```html
<HTML>
  <HEAD>  A 部分  </HEAD>
  <BODY>
    <SCRIPT>  B 部分  </SCRIPT>
    C 部分
  </BODY>
</HTML>
```

完成以下表格：

<table>
<thead>
<tr>
<th>網頁元素</th>
<th>功能</th>
<th>建議部分（A、B 或 C）及原因</th>
</tr>
</thead>
<tbody>
<tr>
<td>超連結</td>
<td>連結至另一網頁</td>
<td>C (1)</td>
</tr>
</tbody>
</table>
(b) 注册页的 HTML 码在不同部分包含超链接、样式页面和元数据，如下展示：

```html
<HTML>
  <HEAD> A 部分 </HEAD>
  <BODY>
    <SCRIPT> B 部分 </SCRIPT>
    C 部分
  </BODY>
</HTML>
```

完成以下表格：

<table>
<thead>
<tr>
<th>网页元素</th>
<th>功能</th>
<th>建议部分（A、B 或 C）及原因</th>
</tr>
</thead>
<tbody>
<tr>
<td>模式页面</td>
<td>建立文件的布局</td>
<td></td>
</tr>
</tbody>
</table>

A – Define the layout and apply it to the entire web page. / Apply an external style sheet to the document. (2)
或
C – Define the layout and apply it to the specific segment. (2)
Include information about the web page such as keywords so as to increase the chance of being searched by search engines (1)

<table>
<thead>
<tr>
<th>網頁元素</th>
<th>功能</th>
<th>建議部分 (A、B 或 C) 及原因</th>
</tr>
</thead>
<tbody>
<tr>
<td>元數據</td>
<td>Include information about the web page such as keywords so as to increase the chance of being searched by search engines (1)</td>
<td>A (1)</td>
</tr>
</tbody>
</table>
No specific software package is required for creating the button. (1)

It is easy to create lively, complex animation effects. (1)
It can be displayed as one image by enlarging it to be $800 \times 600$. (1)

It can be displayed as tiles by repeating it both vertically and horizontally. (1)
偉明是一位攝影師。他建構了一個網站來展示他的相片，相片解像度是 3600×2700。網站內每一個網頁都包含九幅相片的縮圖。當用戶點擊一幅縮圖時，其相關原始大小的相片會在新視窗中顯示。第一頁如下圖展示：

<table>
<thead>
<tr>
<th>偉明的相片庫</th>
</tr>
</thead>
<tbody>
<tr>
<td>點擊以檢視原始大小</td>
</tr>
<tr>
<td><img src="image1.jpg" alt="縮圖1" /> <img src="image2.jpg" alt="縮圖2" /> <img src="image3.jpg" alt="縮圖3" /></td>
</tr>
<tr>
<td><img src="image4.jpg" alt="縮圖4" /> <img src="image5.jpg" alt="縮圖5" /> <img src="image6.jpg" alt="縮圖6" /></td>
</tr>
<tr>
<td><img src="image7.jpg" alt="縮圖7" /> <img src="image8.jpg" alt="縮圖8" /> <img src="image9.jpg" alt="縮圖9" /></td>
</tr>
</tbody>
</table>

1  2  3  4  5
It can show more photos on a web page. / reduce loading time of webpage (1)

- Reduce file size  
- 善用網頁空間

Use photo editing software to reduce the resolution of the photos but keep their aspect ratios.(1)

- 縮小相片  
- 縮小相片  
- 調校解像度

大概一半考生能解释使用缩图的好处，只有部分考生能清楚描述如何製作這些縮圖。
Create a text box to allow users to enter keywords to search.

Create a drop-down list of the categories/sorting/filtering of photos according to place/title/time

Search by tag 標記/標示/標籤

$x$ add title or description to photo
$x$ add search function
$x$ add Search engine

大部分考生能最少寫出一個方法來改進相片搜索。
(c) 偉明重新設計網頁，把九幅相片結合成為單一圖像，如下圖展示。當用戶點擊圖像某一部分時，其相關原始大小的相片會在新視窗中顯示。

### 偉明的相片庫

點擊以檢視原始大小

![圖片](image1.jpg)

(i) 偉明使用了什麼網頁設計功能來實踐這項設計？試簡略描述這個設計功能。
(i) 偉明使用了什麼網頁設計功能來實踐這項設計？試簡略描述這個設計功能。

Image map / Hotspot (2)
/ (hyperlinks on parts of the image) (1)
/ Table – Hyperlinks are added on images (1+1)
/ CSS(樣式表) – Hyperlinks are added on images (1+1)

× 樣式 × 合併
× Use image editing software to combine all images into 1 image

考生似乎不熟悉在網頁設計中運用影像地圖 (image map)。
No, alternative text can be added for text-to-speech service /
Yes, visually impaired user cannot use full keyboard control (e.g. Tab) to navigate the hyperlinks on the image map /
Yes/No, suitable explanation about the use of ALT tag on the image(s)  
(2)  
× cannot see photos well  
× cannot see the edge between photos  
	欠佳
只有少數考生意識到在影像地圖內加入替代文字，便可使用文字轉語音服務。
Preview effectively (Higher resolution) + Thumbnails for selection + Navigation for thumbnails.
Show ALL thumbnails in 1 page with feasible navigation + Effective display (e.g. Load more) (2+1)

Design 2: It should effectively display all the thumbnails on the same page.

User can simply click on the 'load more' button, more thumbnails will be shown and user can scroll down to view more thumbnails.

令人满意
Better web management / auto-backup / recovery service / 7 x 24 support / Lower start-up cost / Hardware maintenance is not needed (1)

× Lower cost × webpage template is given
× Easy web design × 不需購買硬碟
Multiple files can be uploaded at a time / 可以直接大量上載/ Reduce upload time / Maintain folder structure of photos (1)

× It is more secure / × upload is more effective
× Easy to manage (e.g. delete) files
Two factor Authentication/ Two level Authentication/ Two-step verification/ double password/ One time password/ token/sending verification email/ Answer personal questions/ interact with the system
Use a randomized numerical keypad to enter.
Use captcha

Users have to wait for a few seconds to re-enter the information when the input is incorrect (1, 1)

× 登記時以手機認証, ×申請時以電郵認証
李先生建構了一個原型來顯示購物列表，如下展示：

<table>
<thead>
<tr>
<th>玩具（4 – 8 歲）</th>
<th>購物列表</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>編碼</strong></td>
<td><strong>描述</strong></td>
</tr>
<tr>
<td>1015</td>
<td>動物砌圖 (100 塊)</td>
</tr>
<tr>
<td>0529</td>
<td>紅色皮球</td>
</tr>
<tr>
<td>1375</td>
<td>貨車</td>
</tr>
<tr>
<td><strong>總數</strong>:</td>
<td></td>
</tr>
</tbody>
</table>

清空

訂購及支付

(b) (i) 試建議在表格中增設兩個欄，以協助顧客購物，並簡略說明你的建議。

![EA logo]
<table>
<thead>
<tr>
<th>編碼</th>
<th>描述</th>
<th>單價</th>
<th>+/−</th>
</tr>
</thead>
<tbody>
<tr>
<td>1015</td>
<td>動物砌圖 (100 塊)</td>
<td>$40</td>
<td>+1</td>
</tr>
<tr>
<td>0529</td>
<td>紅色皮球</td>
<td>$25</td>
<td>+1</td>
</tr>
<tr>
<td>1375</td>
<td>貨車</td>
<td>$99</td>
<td>-1</td>
</tr>
</tbody>
</table>

總數： $164

(b) (i) 試建議在表格中增設兩個欄，以協助顧客購物，並簡略說明你的建議。

Total quantity of a single toy item
Subtotal of a single toy item
Stock of a single toy item
They allow users to know the details of the ordered items such as photos, description, sells volume or other options (1+1)

× column of selected items × button × pull down menu
When ‘-1’ button is clicked, if \( P[i] > 0 \), \[
P[i] \leftarrow P[i] - 1
\]

**Condition ①**
Decrement of the content of the variable ①
Mention \( P[i] \) or any example of \( P[i] \) ①
當設計「清空」按鈕的回應動作時，李先生決定在此網頁而非一個新網頁內展示一個對話視窗，如下所示：

<table>
<thead>
<tr>
<th>玩具 (4 - 8 歲)</th>
</tr>
</thead>
<tbody>
<tr>
<td>購物列表</td>
</tr>
</tbody>
</table>
| 編碼 | 描述   | 單價 | / 
| 1015 | 動物砌圖 (A015) | $40 | +1 -1 |
| 0129 | 紅色皮球   | $25 | +1 -1 |
| 1275 | 貨車     | $30 | +1 -1 |

(c) (i) 使用此對話視窗的優點是什麼？
It keeps the original web page and saves time to re-load the page when the ‘Cancel’ button is clicked.

(1)

✗ For confirmation
✗ prevent miss pressing the clear button

考生似乎不熟悉在網頁設計上使用對話視窗，其中部分考生將它與跳出式視窗混淆。
(ii) 試舉出李先生可調整此對話視窗的三個屬性。

 colour, size, location, title, opacity, button/ icon (1,1,1)

 × Pixel × aspect ratio × colour depth × font × resolution
 ×顯示方式 ×彈出效果
Compare different items/ avoid duplication
Keep the items for purchase next time.
Payment at a time/ check out/ provide summary/
edit the shopping items
(1,1)

× work load of server

大概一半考生展示對使用購物車有經驗。
令人滿意
Layout: The display size is different/ 避免錯誤呈現

File size: The file size should be smaller because the effective data transfer rate of mobile devices is limited/ data cost/佔很多數據

Compatibility: Multimedia elements may not be supported/ lack of the required plug in or driver/ 避免無法顯示/處理性能較差, 過多多媒體元素容易導致當機 (1,1)

令人滿意
HKDSE ICT 2015

Paper 2D review
### 2015 HKDSE ICT-D sharing workshop

(1105 candidates)

2015-11-21
2015-11-27

<table>
<thead>
<tr>
<th>Candidates Performance</th>
<th>Range</th>
<th>Star</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Poor</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Fair</td>
<td>**</td>
</tr>
<tr>
<td></td>
<td>Satisfactory</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>****</td>
</tr>
<tr>
<td></td>
<td>Excellent</td>
<td>*****</td>
</tr>
</tbody>
</table>
Q1

1. \( \text{Func}(a, b) \) is a function with two positive integer inputs \( a \) and \( b \), where \( a \geq b \). It returns the integral part of \( (a \div b) \). For example,

\( \text{Func}(6, 2) \) returns 3 and \( \text{Func}(7, 3) \) returns 2.

(a) (i) What will \( \text{Func}(14, 3) \) return? \( \boxed{4} \) \( \boxed{(1) \text{****}} \)

(ii) \( \text{mod}(a, b) \) is a function that returns the remainder of \( (a \div b) \). Complete the pseudocode of \( \text{Func}(a, b) \) below.

\[
\text{Func}(a, b) \\
\text{c} \leftarrow \text{mod}(a, b) \\
\text{return } (\boxed{a-c}) \div b \]

(2) ****

(3 marks)

The following algorithm ALG1 processes a Boolean array \( B \) with indices from 1 to \( n \).

\textbf{ALG1}

Step 1: for \( k \) from 1 to \( n \) do Step 2
Step 2: \( B[k] \leftarrow \text{True} \)
Step 3: \( B[1] \leftarrow \text{False} \)
Step 4: for \( i \) from 1 to \( n \) do Steps 5 to 7
Step 5: if \( B[i] = \text{True} \) then do Steps 6 to 7
Step 6: for \( j \) from 2 to \( \text{Func}(n, i) \)
Step 7: \( B[i \times j] \leftarrow \text{False} \)
(b) Suppose \( n = 10 \). Dry run ALG1. Use ‘F’ and ‘T’ to denote ‘False’ and ‘True’ respectively in the following tables.

(i) Fill in the content of \( B \) after the first pass and second pass of the loop in Step 4.

After first pass

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

After second pass

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

(ii) Fill in the final content of \( B \).

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

\[
\begin{array}{|c|c|}
\hline
i & j \leftarrow 2 \text{ to } \text{Func}(n, i) & i \times j \\
\hline
2 & 2 \text{ to } 5 & 4, 6, 8, 10 \\
3 & 2 \text{ to } 3 & 6, 9 \\
4 & 2 \text{ to } 2 & 8 \\
5 & 2 \text{ to } 1 & - \\
\hline
\end{array}
\]
(iii) How many times will the statement in Step 7 be executed? \[7\] (1)**

(iv) What is the purpose of ALG1? **Find the prime numbers between 1 and n.** (1)***

(c) (i) It is suggested that Step 4 should be changed to

\[
\text{for } i \text{ from 2 to } n \text{ do Steps 5 to 7}
\]

Will this change affect the final content of B? Justify your answer. **The final content remain unchanged because the value of B[1] is always false when executing Step 5.** (2)***

(ii) It is suggested that changing Step 4 to

\[
\text{for } i \text{ from 1 to } \text{Func}(n, 2) \text{ do Steps 5 to 7}
\]

\[\text{can improve the algorithm. Do you agree? Justify your answer.} \]

**Yes, Func(n,i) = 1 when i > Func(n,2), so Steps 6 to 7 will not be executed when i > Func(n,2).** (2)**

(iii) ALG1 will be executed many times. Should it be implemented in a compiled language or an interpreted language? Explain briefly. **A compiled language should be used because the executed code can be optimized better such that the running time of the program is short.** (2)***
2. John is a project manager. He develops a vehicle repair system. The development work involves four major tasks. The duration and dependencies of the tasks are shown below:

<table>
<thead>
<tr>
<th>Task</th>
<th>Duration (week)</th>
<th>Task(s) that it depends on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1</td>
<td>3</td>
<td>Task 2</td>
</tr>
<tr>
<td>Task 2</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Task 3</td>
<td>3</td>
<td>Task 1 and Task 4</td>
</tr>
<tr>
<td>Task 4</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Task 5</td>
<td>3</td>
<td>Task 4</td>
</tr>
</tbody>
</table>

(a) (i) Complete the Gantt chart of the project below.

(ii) Suppose that John spends more money to reduce the duration of Task 1, Task 2 and Task 3 by 1 week each. What is the duration of the new critical path of the project?
Q2

(b) (i) Task 2 is part of the requirements analysis stage. Give two common activities that John can do to collect the requirements when doing Task 2.

interview, questionnaire, collecting documents, observation, system walkthrough

(ii) Task 1 is part of the implementation stage. After completing Task 1, what documents will be prepared? Give one example and explain its use briefly.

A user manual will be prepared.

It describes how to use the system.
Q2

(i) Modularity

The system development is a large project. The system can be separately developed in modules (program units), so that the project can be decomposed for different programmers to handle.

(ii) Portability

The source code can be compiled on different platforms without major changes. It saves the development cost on writing source codes for different platforms.

(iii) Utility libraries and development tools

With a wide range of utility libraries and efficient development tools, the application development time can be shortened.

(d) When compiling the program code of the system, a linker is used. What is the purpose of the linker?

The linker is used to incorporate external libraries into the program.
Tony is developing a yearly school calendar system. There are events, $E_1$, $E_2$, etc. marked in the calendar using 1-52 and 1-7 to denote the weeks and the days respectively, as shown in the example below. Assume that there is only one event at most each day.

3.

<table>
<thead>
<tr>
<th>Week</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>E4</td>
<td></td>
<td></td>
<td>E2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$(x, y)$ represents Day $y$ in Week $x$ in the calendar. Tony wants to use an array $M$ so that $M[x, y]$ stores the name of the event on $(x, y)$. $M[x, y]$ stores 0 if there is no event on that day.

(a) Referring to the example above, complete the following table to illustrate the content of $M$.

<table>
<thead>
<tr>
<th>Array Element</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M[1, 5]$</td>
<td>E3</td>
</tr>
<tr>
<td>$M[3, 2]$</td>
<td>E4</td>
</tr>
<tr>
<td>$M[3, 3]$</td>
<td>0</td>
</tr>
</tbody>
</table>

(1)***** (1)***** (2 marks)
Tony decides to use three global arrays \textit{name}, \textit{x} and \textit{y} to store the information on the events in the calendar in chronological order, as shown in the example below.

<table>
<thead>
<tr>
<th>\textit{i}</th>
<th>\textit{name[i]}</th>
<th>\textit{i}</th>
<th>\textit{x[i]}</th>
<th>\textit{i}</th>
<th>\textit{y[i]}</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>\textit{E1}</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>\textit{E3}</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>\textit{E4}</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>\textit{E2}</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

(b) Tony writes a subprogram \textit{Lname \(p, q\)} that returns the name of the event on Day \textit{q} in Week \textit{p}. It returns 0 if there is no event on that day.

(i) Suppose that \(n\) stores the total number of events. Complete the pseudocode of \textit{Lname} below.

\begin{verbatim}
Lname(p, q)
    event \leftarrow 0
    for \(i\) from 1 to \(n\) do
        if \((x[i] = p)\) and \((y[i] = q)\) do
            event \leftarrow \textit{name[i]}
    return event
\end{verbatim}

(ii) Suppose \(n = 4\). When \textit{Lname(2, 3)} is called, how many times will the statement on the third line be executed?

\textbf{4} \hspace{1cm} \(1)****

(iii) Compared with \textit{M} in (a), give one advantage and one disadvantage of using the three arrays to store information on the events.

\textbf{Advantage:} It requires \textbf{less storage space} when the number of events is much fewer than \(7 \times 52\). \(1)*\n
\textbf{Disadvantage:} The \textbf{access time} to retrieve an event is \textbf{longer}. / The \textbf{complexity} of the use of the \textbf{data structure} is \textbf{higher}. \(1)**
Tony writes a subprogram \( \text{order}(x_1, y_1, x_2, y_2) \) that returns TRUE only when \((x_1, y_1)\) is earlier than \((x_2, y_2)\) in the calendar; otherwise, it returns FALSE.

(c) Complete the following pseudocode of \( \text{order} \).

\[
\text{order}(x_1, y_1, x_2, y_2) \\
\text{week} \\
\text{if } (x_1 < x_2) \text{ return TRUE} \\
\text{else if } (x_1 > x_2) \text{ return } \text{FALSE} \quad \text{(1)*****} \\
\text{day} \\
\text{else if } (y_1 < y_2) \text{ return TRUE} \\
\text{else return } \text{FALSE} \quad \text{(1)*****} \\
\] (2 marks)
Tony writes another subprogram `shift(a, b)` that shifts all the entries with indices between `a` and `b` backward by one position in each of the three arrays. For example, `name[b+1]` stores the value in `name[b]`, `name[b]` stores the value in `name[b-1]`, and so on. Finally, `name[a+1]` stores the value in `name[a]`; the corresponding entries in `x` and `y` will shift too. Assume that there are `n` events in the calendar.

<table>
<thead>
<tr>
<th>i</th>
<th>name[i]</th>
<th>i</th>
<th>x[i]</th>
<th>i</th>
<th>y[i]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>E3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>n</td>
<td>E88</td>
<td>n</td>
<td>52</td>
<td>n</td>
<td>4</td>
</tr>
</tbody>
</table>

Tony wants to store a new event in the three arrays in chronological order where the event name and its date are stored in `NewName` and `(Newx, Newy)` respectively. There are two subprograms `order` and `shift` available:

<table>
<thead>
<tr>
<th>Pascal version</th>
<th>Function <code>order(x1, y1, x2, y2 : integer) : boolean</code>&lt;br&gt;Procedure <code>shift(a, b : integer)</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>C and Java version</td>
<td><code>int order(int x1, int y1, int x2, int y2)</code>&lt;br&gt;<code>void shift(int a, int b)</code></td>
</tr>
<tr>
<td>Visual Basic version</td>
<td><code>Function order(x1 As Integer, y1 As Integer, x2 As Integer, y2 As Integer) As Boolean</code>&lt;br&gt;<code>Sub shift(a As Integer, b As Integer)</code></td>
</tr>
</tbody>
</table>

(d) Write a subprogram `InsertEvent` in Pascal, C, Visual Basic or Java that stores the information on the new event in the calendar in chronological order using the binary search technique.
Q3

(d) ① initialisation
② loop of a binary search
③ mid
④ compare 2 dates
⑤ use of shift(__, n)

[Pascal version]

procedure InsertEvent(Newx, Newy : integer);
var
  first, last, mid : integer;
begin
  first := 1;
  last := n;
  while (first < last) do begin
    mid := (first + last) DIV 2;
    if order(x[mid], y[mid], Newx, Newy) then
      first := mid+1
    else last := mid;
  end;
  shift(first, n);
  name[first] := NewName;
  x[first] := Newx;
  y[first] := Newy;
  printQ; readln;
end;
Mary wants to develop an online storage system so that customers can store text files in centralised servers and retrieve them later. In order to minimise the demands on storage capacity, all files will be compressed before storage.

(a) The flow of data in the online storage system is shown below:

Match the following items:

- A. File storage module
- B. File database
- C. File retrieval module
- D. Compression & depression module
- E. File ID verification module
- F. Customers
There are many words in the text files. Mary considers using 16-bit fixed-length binary sequences or variable-length binary sequences to encode the words. Each variable-length binary sequence has only one ‘1’. An example is shown below:

<table>
<thead>
<tr>
<th>Word</th>
<th>Fixed-length binary sequence</th>
<th>Variable-length binary sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>pen</td>
<td>0000000000000000</td>
<td>1</td>
</tr>
<tr>
<td>a</td>
<td>0000000000000001</td>
<td>01</td>
</tr>
<tr>
<td>man</td>
<td>000000000000000010</td>
<td>001</td>
</tr>
<tr>
<td>has</td>
<td>00000000000000000111</td>
<td>0001</td>
</tr>
<tr>
<td>Peter</td>
<td>0000000000000000100</td>
<td>00001</td>
</tr>
<tr>
<td>is</td>
<td>00000000000000000101</td>
<td>000001</td>
</tr>
<tr>
<td>and</td>
<td>00000000000000000110</td>
<td>0000001</td>
</tr>
</tbody>
</table>

(b) (i) Give an advantage of using fixed-length binary sequences.

**It is easy to manage the sequences in the storage / access the words**  (1)**

(ii) Give an advantage of using variable-length binary sequences.

**It can save storage space when some words are used frequently.**  (1)**

Mary decides to use variable-length binary sequences.

(c) According to the table above, ‘Peter has a pen’ will be encoded as

‘0000100001011’

(i) Encode ‘Peter is a man’.

**00001 000001 01 001**  (1)**

(ii) Decode ‘010010000001011’.

**a man and a pen**  (1)**

(2 marks)
(d) Mary writes a function $\text{DEC}(\text{st})$ that returns the words in a look-up table for variable-length binary sequences, as shown in the example below.

<table>
<thead>
<tr>
<th>Variable-length binary sequence</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pen</td>
</tr>
<tr>
<td>01</td>
<td>a</td>
</tr>
<tr>
<td>001</td>
<td>man</td>
</tr>
<tr>
<td>0001</td>
<td>has</td>
</tr>
<tr>
<td>00001</td>
<td>Peter</td>
</tr>
<tr>
<td>000001</td>
<td>is</td>
</tr>
<tr>
<td>0000001</td>
<td>and</td>
</tr>
<tr>
<td>:</td>
<td>:</td>
</tr>
</tbody>
</table>

Assume that a character array $B$ with length $n$ stores the encoded binary sequences for a text file. Write a pseudocode to decode the sequences and display the text with the use of $\text{DEC}$.

(d) ① initialize a temporary string ② loop ③ concatenate the temporary string until “1” is scanned ④ call $\text{DEC}(\text{temp string})$ and print the results ⑤ print a space

\[
\text{st} \leftarrow \text{null string} \\
\text{for i from 1 to n} \\
\quad \text{st} \leftarrow \text{concatenate st with B[i]} \\
\quad \text{if } B[i] = 1 \text{ then do} \\
\quad \quad \text{display } \text{DEC}(\text{st}) \\
\quad \quad \text{if } i \not= n \text{ do} \\
\quad \quad \quad \text{display a space} \\
\quad \text{st} \leftarrow \text{null string}
\]