

Marking Schemes

This document was prepared for markers' reference. It should not be regarded as a set of model answers. Candidates and teachers who were not involved in the marking process are advised to interpret its content with care.

General Notes on Marking

1. Teachers are strongly advised to conduct their own internal standardisation procedures using the marking scheme before the actual marking begins. After standardisation, teachers should adhere to the marking scheme to ensure a uniform standard of marking within the school.
2. The marking scheme may not exhaust all possible answers for each question. Teachers should exercise their professional discretion and judgment in accepting alternative answers that are not in the marking scheme, but are correct and well-reasoned.
3. The following symbols are used:

- ✘ This symbol indicates a wrong or unacceptable answer.
- Shaded words, figures or ideas are not essential for the candidate to be awarded the point.
- / A single slash indicates an acceptable alternative within an answer.
- + A plus sign indicates that there are two pieces of information and the second part will be awarded points only when the first part is correct.

4. In questions asking for a specified number of reasons or examples etc. and a candidate gives more than the required number, the extra answers should not be marked. For instance, in a question asking candidates to provide two examples, and if a candidate gives three answers, only the first two should be marked.

Paper 1 (Section A)

Question No.	Key	Question No.	Key
1.	A (40%)	21.	D (37%)
2.	D (42%)	22.	C (76%)
3.	C (51%)	23.	A (89%)
4.	B (75%)	24.	D (88%)
5.	B (74%)	25.	D (35%)
6.	C (50%)	26.	D (59%)
7.	A (80%)	27.	A (57%)
8.	A (74%)	28.	A (69%)
9.	B (79%)	29.	D (52%)
10.	D (59%)	30.	B (48%)
11.	A (52%)	31.	D (85%)
12.	C (55%)	32.	A (54%)
13.	D (28%)	33.	C (84%)
14.	D (36%)	34.	D (68%)
15.	B (71%)	35.	C (50%)
16.	C (88%)	36.	B (66%)
17.	B (72%)	37.	A (78%)
18.	C (80%)	38.	A (71%)
19.	C (62%)	39.	B (94%)
20.	A (87%)	40.	B (65%)

Note: Figures in brackets indicate the percentages of candidates choosing the correct answers.

Paper 1 (Section B)

Marks

- | | |
|---|-----|
| 1. (a) (i) X : modem / router | 1 |
| Z : Access Point / AP / wireless router | 1 |
| (ii) Share printer / storage space → hardware sharing | 1 |
| Exchange data (file sharing) → file sharing | 1 |
| (b) (i) Repetitive use of wrist / finger / muscle / tendons of arm for data entry | 1 |
| (ii) wrist rest / mouse with the ergonomic design | 1 |
| (c) Take short breaks periodically during the use. /
Maintain a good posture. /
Use an anti-glare screen cover. /
Turn on the night shift mode to filter blue light. /
Look at distant objects. /
Use an ergonomic keyboard / mouse. | 1×2 |
| (simply 'look at green objects' ✘, unless the answer includes distant objects like trees) | |
| (d) (i) It can filter network traffic/block unauthorised access ①
to the server. ① | 1+1 |
| (ii) SSL encrypts information/sensitive data such as usernames and passwords, and credit card
information ①
transmitted between Mrs Wong (customers) and the web site. ① | 1+1 |

	Marks
2. (a) Users can access network services anywhere in the library without the limitation of cable connection. The number of network connections can be flexible. Allows WiFi-only devices to access network services	1×2
(b) RAM: volatile; higher data transfer rate; smaller storage size; CPU is able to access directly; holds program/data currently being executed by the CPU SSD: non-volatile; lower data transfer rate; larger storage size; CPU is not able to access directly; holds program/data for long-term storage	1×2
(c) 5 GHz: the clock rate of CPU 10 cores: 10 processing units within a CPU	1 1
(d) Virtual keyboard, speech recognition, handwriting recognition Alternatives: on-screen keyboard, voice recognition, speech-to-text	1×2
(e) allow Internet access via SIM card when WiFi is not available lighter in weight to increase portability ✓ cellular network/mobile data (as an alternative to via SIM card) ✓ smaller in size (as an alternative to lighter in weight) × lower power consumption	1 1
(f) When the operating systems of all the devices use the same communication protocol for data communication, files can be transferred successfully. ✓ FTP (as a specific example of the same communication protocol) ✓ TCP/IP (as a specific example of same communication protocol)	2
3. (a) (i) $\underline{0100}$ ① ①	1, 1
(ii) $\underline{1001}$ ① ①	1, 1
(iii) OR $\{I = 1\}$	1, 1
(b) 4 1 1	1×3
(c) People may not easily access the Internet. (Internet access/hardware) People may find difficult in operating electronic devices to learn the online materials. (Digital divide/literacy)	1×2

4. (a) Design 1: Marks other than multiples of 10 can be entered.
 One subject must be selected. / Avoid multiple subject selection.
 The subjects to be chosen could be added easily without changing the layout.
 (Occupy less space)
 Design 2: It ensures that numeric data is entered in the Mark.
 One or more subjects can be entered.
 All options can be viewed at a glance. 1×2
- (b) (i) 10409 1
- (ii) Double entry / Enter the number by two different persons/print out for checking 1
- (c) (i) IDNO + SUBJECT 1
- (ii) Chinese 70 2
 English 88
 Mathematics 90
 ① Group by (3 rows with correct subjects)
 ① Average (correct calculation) + others (column order, no extra fields/symbols, correctly match)
 *row order is not significant.
- (d) $\text{=COUNTIF}(D\$2:D4, D4)$ 1
 3 1
- (e) (i) 2 1
- (ii) It ensures that students with the same marks are of the same rank. 2
 (Only mention 'same marks' but not mention 'with the same rank' ①)
5. (a) $15 \times 15 \times 2 = 450$ bits 2
 - only expression ①
 - only answer ②
- (b) Blue/B 1 1, 1
- (c) (i)

G	G	G	G	B	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

2
 Any one code ①
- (ii) 100010 110001 101100 Any one ① 2
- (iii) (1) 6 1
- (2) $15 \times 6 = 90$ 2
 - only expression ①
 - only answer ②
- (iv) The computation power (CPU) ① should be considered because the encoding scheme involves extra computation for representation. ① 1+1

Paper 2A

	Marks
1. (a) SELECT PNAME FROM PSTUD WHERE <u>SID = 'S0013'</u> ①	2
	① all correct
(b) SELECT COUNT(PID) FROM SCHOOL, PSTUD WHERE <u>SCHOOL.SID = PSTUD.SID</u> AND <u>SNAME LIKE '%GOVERNMENT%'</u> ① ①	3
Alternative: SELECT COUNT(*) FROM PSTUD WHERE SID IN (SELECT SID FROM SCHOOL WHERE SNAME LIKE '%GOVERNMENT%')	
(c) SELECT PNAME FROM PSTUD P , MARK M WHERE P.PID = M.PID AND GP='J' AND SMARK >= 60	3
	① ① ①
(d) Find the <u>first-time</u> participating students of the <u>Senior</u> group who are <u>absent</u> from the competition (or no marks). ① ① ① (2 out of 3)	2
(e) SUM(SMARK) S.SID = P.SID and P.PID = M.PID S.SID	1 1 1
(f) SELECT SNAME FROM TM, SCHOOL S WHERE TM.SID = S.SID AND TOTAL IN (SELECT MAX(TOTAL) FROM TM) ↑ =	2
Alternative: SELECT SNAME FROM SCHOOL WHERE SID IN (SELECT SID FROM TM WHERE TOTAL IN (SELECT MAX(TOTAL) FROM TM))	
① a proper table join ① correct use of IN ① SELECT statement (2 out of 3)	

2. (a) ITEMNO + DOB
ITEMNO + DOR

1
1

(b) (i) FINE is the derived attribute of CIR. FINE can be calculated by DOB and DOR.

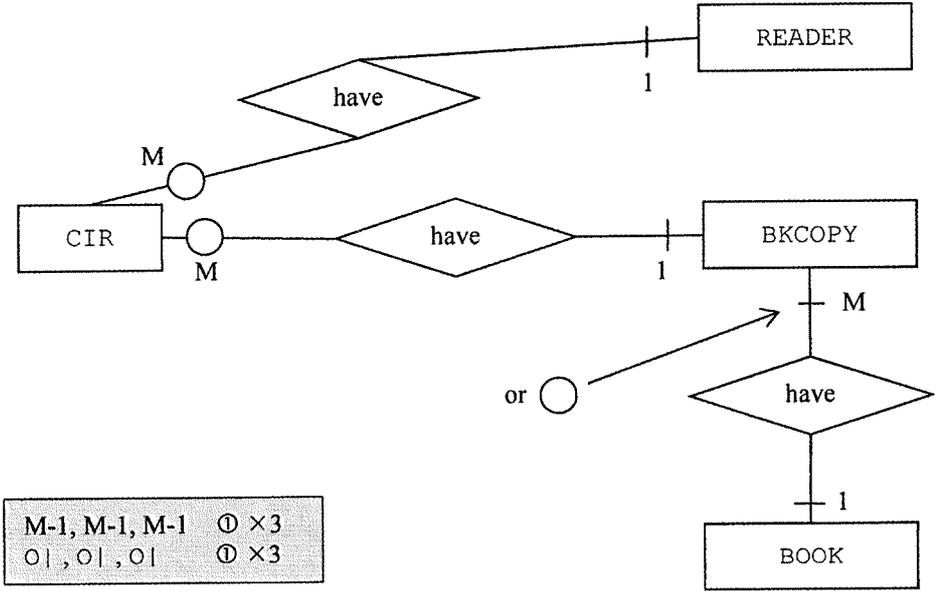
1×2

(ii) It can increase query efficiency because there is no need to calculate the value FINE every time when running a query.

1

(c)

6



(d) (i) It is because NAME is not unique, two students may have the same name,
⓪ unique ⓪ elaboration
(⓪ only state 'entity integrity')

2

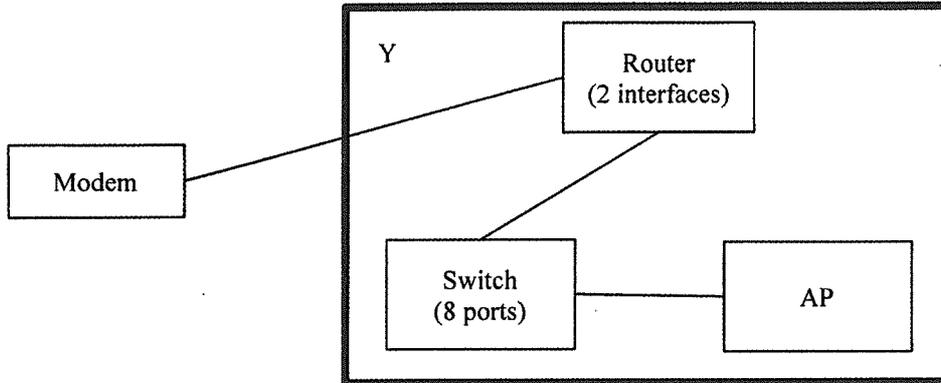
(ii) R0132 in CIR cannot be identified.
⓪ concept of referential integrity ⓪ elaboration

2

	Marks
3. (a) (i) UNIQUE	1
(ii) No fields will be left blank/There is no missing mark.	1
It is forced to enter a value that may not be feasible (e.g. absence or disqualification, no marks before the contest)	1
(b) (i) Data loss (all data entered will be dropped) Re-enter or insert data. Need to set indexes when re-creating the table. referential integrity issue	1×2
(ii) FOREIGN REFERENCES	1, 1
(c) (i) STUDID Identity code of student	1
ROLE Role in the team (True for leader, False for member) (reasonable description)	1
(ii) No repeated fields / No fields without values / No (reduce) data redundancy	1
(iii) Fewer tables / SQL operations are needed and it is more efficient to manipulate the tables.	1
(d) - Create an appropriate layout - Reduce unwanted columns - Show the champion, first runners-up, and second runners-up only (single row for each entry with/without student names) - Describe the design accordingly (private information / redundant data)	1×4

4. (a) (i) Database/Data developer/specialist/analyst 1
- (ii) Schema analysis, ER diagram, DFD (data flow diagram), user requirement specification (or examples of relevant deliverables) 1×2
- (b) Same field with different data format (MID) 1×3
 Same field with different data length (MID)
 Same field with different data type (GENDER)
 Duplicated member in the two data tables (i.e. same person in the two original tables)
- (c) (i) It can be simple and easy to implement when the table structures are simple. (less time for development) 1
- (ii) Data conflict or membership redundancy can be easily handled. (coding flexibility) 1
- (d) Prepare/Clean data. 1
 Conduct analysis or estimation using the data. 1
 Utilise a sales strategy for improving the business. 1
- (e) (i) Phone number is a natural key that has contextual meaning. It may need to be changed and cannot stand the test of time. A surrogate key such as the identity code of a member should be more appropriate for being a primary key in the context. 2
 / Phone numbers may be changed. / No phone numbers can be given.
 (2 reasons or 1 reason + elaboration)
- (ii) It can be used for data recovery if there is data corruption. 1×2
 More indexes can be set to improve the query performance.
 The data/record can be better validated.

1. (a) (i)



Modem to Router		1
Other connections		1
(ii)	192.168.1.4 12.34.5.6	1
	98.76.54.32 12.34.5.6	1
(b) (i)	Reduce the chance of IP conflicts	1
	Reduce the workload of manual IP assignment / automatic assignment	1
(ii)	Default gateway / subnet mask / DNS server / IP	1×2
(iii)	Router / default gateway: It is necessary for connecting to the Internet. / Network printer: It is difficult for computers to connect to if the IP address keeps changing. / NAS: It is difficult for computers to connect to if the IP address keeps changing. / Switch: It is required for easy management and configuration of the switch. / AP: It is required for easy management and configuration of the AP.	1+1
(c)	Using WPA2 / using MAC filtering / using VPN / disabling SSID broadcasting / using firewall	1×2
(d) (i)	ping 127.0.0.1 is to test if the network interface card / local network is functioning properly.	1
(ii)	ping 192.168.1.1 is to test if the branch network is functioning properly. / ping 210.12.0.1 is to test if the branch network is connecting to the Internet normally. / ping 12.34.5.6 is to test if the file server in headquarters is normally functioning.	1×2

		Marks
2.	(a) Easy setup / not interfered by signal from other rooms	1×2
	(b) Higher data transfer rate / longer connection distance / higher security level	1×2
	(c) Simplex: Sound data is transferred in a single direction from the microphone to the receiver / speaker. Duplex: Tablet computers send commands on choosing MVs and receive selected playlists. * Other reasonable devices (e.g. remote controller) with justification	1 1
	(d) (i) $500 \times 8 / 400 = 10s$	2*
	(ii) $1000 / 5 = 200$	2*
	(e) In a room: 5 GHz should be used, as streaming video needs a higher data transmission speed. In different areas in the restaurant: 2.4 GHz should be used, as it has higher penetration power, the connection will not be affected even if the customer occasionally leaves the room. 5 & 2.4 GHz ① Justification on 5 GHz ① Justification on 2.4 GHz ①	3
	(f) Guest WiFi and the system for choosing MVs are using the same frequency / same channel. Data traffic from customers interferes with the network of the MV system.	1 1

3. (a) Prevent unauthorized access 1
 Isolate network traffics to prevent congestion 1
- (b) Staff room: 192.168.10.126 1
 Computer room: 255.255.255.192 1
 Classroom: 192.168.10.222 1
 Server room: 192.168.10.225 1
- (c) Login authentication 1×2
 User rights control
 Enforce security policy

- (d) (i) 1×2

Folder	Teacher group permission		Student group permission	
	Read	Write	Read	Write
FolderA	✓	✓	✓	✗
FolderB	✓	✓	✗	✓

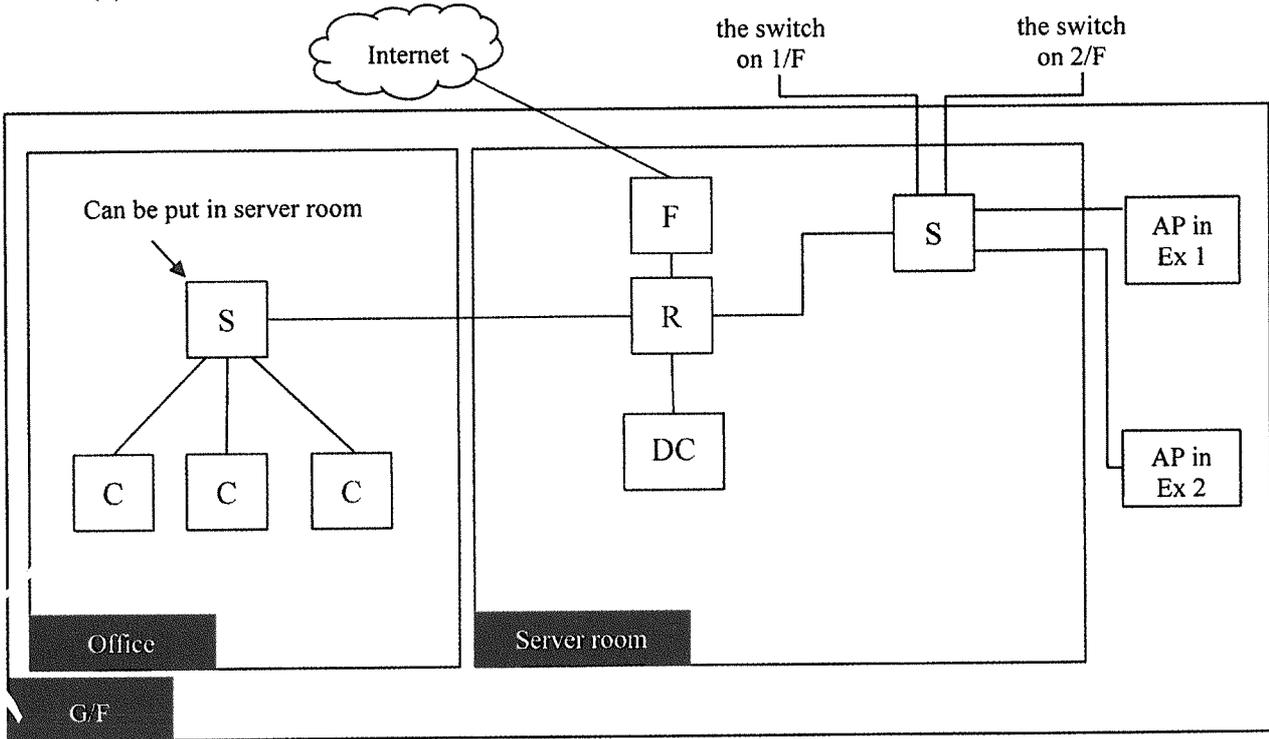
⓪ one row or two columns correct

- (ii) Execute / Full control 1
- (iii) RAID-0: 1
 Connecting two or more hard disks and store data separately. 1
 As the data I/O can be performed simultaneously, data access speed can be raised. 1
- RAID-5: 1
 By using 3 or more hard disks, one of the hard disks can be used to store the parity data of other disks for checksum purposes. 1
 In case one of the hard disks corrupts, data can be recovered based on the data in other disks. 1
- ⓪ Describe ⓪ Benefit

4. (a) Advantage: The network can still function even if an AP breaks down 1
 Disadvantage: The network cannot function if the central switch breaks down. / It requires a huge amount of cables. 1
- (b) The connection from the server room exceeds the limit of 100 meters. / 1×2
 There are many visitors in the exhibition rooms /
 The exhibition rooms are affected by external interference.
- (c) Plan 1: It balances the traffics between the two floors 1
 Plan 2: The connection distance is shorter. 1
- (d) Use the same SSID 1×2
 Use the same encryption settings
 Enable the WiFi roaming function in the APs

- (e) (i) Advantage: It can protect both the office network and WiFi network from external attacks. 1
 Disadvantage: The firewall cannot protect the office network from attacks through the WiFi users in the exhibition rooms. 1

(ii)



- Server room: 1
 Add a firewall and a router and connect correctly to the server room. 1
 Router separates the WiFi network and office network 1
 Connect 3 computers in the office network to the switch 1
 DC is set up in internal network 1

- (iii) DC connected to the router: It can set the regions that can be connected to DC in the router, so the security is high. 1
 DC connected to switch in Office: It can avoid connections from the WiFi network to DC, so the security is high.
 DC connected to the switch in the WiFi network: DC can be put in server room, so as to reduce the cable distance for the connection.

		Marks
1. (a)	<p>Answer must be related to the video quality</p> <p>Option A: Resolution: The video is more blur Frame per second: The video playback is less smooth.</p> <p>Option B: Resolution: The video shows more details / clearer Frame per second: The video playback is smoother /more fluent</p>	1×2
(b)	$500\text{MB} / 40 \text{ min} = 500 * 1024 * 1024 * 8 / (40 * 60) / 1000$ $= 1747 \text{ kbps}$	1 1
(c) (i)	<p>It reduces network traffic of his home network. (bandwidth) / A high bandwidth is available. It reduces Mr. Wong's workload on providing streaming services (e.g. streaming setting, other popular functions (e.g. Comment, like and share)) Video sharing platform provides technical support (e.g. hardware maintenance services, backup support) / reduces the cost of maintaining servers If the web server is out of order / shut down / not available, the video service is still available for the students.</p>	1×2
(ii)	<p>Network aspect:</p> <ul style="list-style-type: none"> • The platform detects that the transmission rate / bandwidth of the Internet connection is low. / The network connection is poor. / The platform reduces users' data usage in the mobile data network. <p>Device aspects:</p> <ul style="list-style-type: none"> • The platform detects that the screen resolution of the user device is low. / The screen resolution of the device used is low. / The processing power of the user device is low. <p>Server aspects:</p> <ul style="list-style-type: none"> • The platform can support more concurrent users (in busy hours). <p>Playback:</p> <ul style="list-style-type: none"> • It reduces the initial playback delay. <p>Design aspects:</p> <ul style="list-style-type: none"> • The platform uses the user's <u>previous</u> setting/preferences to provide this resolution. 	1×2
(iii)	<p>HTML code / iframe / XML Insert the code into his web page.</p>	1 1

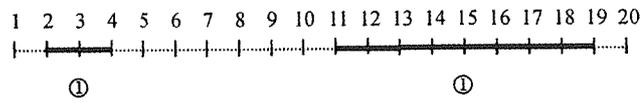
- (d) Invalid input can be entered. / example of unreasonable input
 Designs to address this problem:
 • Use radio buttons
 • Use checkboxes
 • Use drop-down lists / select list
 • Use button to show options /
 • Use validation check / check to limit the input in the textbox
 • Use scripts/codes such that user can click the option directly
 1
 1×2
- (e) Adaptation / Responsive web pages / RWD
 • Change the layout of website to suit difference devices / browsers / operating systems.
 1×2
- Layout /Format /style / design:
 • Provide the consistent or unified layout/format/style/design of web pages in the website. / It is easier to maintain or update the layout/design/format/style/design of web pages in the website. / Use an external style sheet to unify or update the style of web pages.
- Enrich format/layout/style:
 • Provide enriched or more formats or layouts or styles / concrete examples that can be created by CSS but not HTML, e.g. filter / online font / animated effects / layer / font type.
2. (a) (i) It has higher compatibility for different platforms / cross platform.
 No installation is needed.
 Save the storage. / The web site can store more materials than a mobile application.
 The content can be updated/maintained easily.
 1×2
- (ii) Test HTML codes to be supported by different popular browsers.
 Test plug-in to be supported by different popular browsers.
 Add a script to detect the type of browser and then execute the corresponding program statements for the browser detected.
 1×2
- (iii) Use a client script to record the time of the user's computer.
 Create a pop-up alert message after a period of time.
 1
 1
- (b) (i) The file size of the image will remain unchanged because the HTML code does not affect the original file.
 1
- (ii) alternative text (other reasonable answers), title
 1
- (iii) Create an image map for the objects.
 Click/use mouse over to pop up a (overlay) window to show the vocabularies.
 1
 1
- (c) Client-side scripts: It has less loading on the server / quick response.
 1
- Server-side scripts: Student performance can be immediately stored in a database. /
 Prevent students from getting the answer in the client-side scripts.
 1
- (d) *happysch.com.hk / happysch.org / hkhappysch1.edu* (other reasonable domains)
 1
- (e) Create a QR code with the URL.
 Apply URL shortening to create a shorter URL.
 1×2

		Marks
3.	(a) (i) MIDI / RIFF	1
	(ii) It can be edited easily. / It can be played in an instrument other than the piano.	1
	(b) (i) Amplitude/loudness/volume, Phase (pitch/frequency), tempo/speed, number of channels * sampling rate / sampling size, panning / fade in fade out / length	1×2
	(ii) Lossy compression: smaller in file size	1
	Lossless compression: better audio quality / can convert back to the original file	1
	(c) (i) $(22.05 \times 1000) \times 16 \times (3 \times 60) / 5 / 1024 / 8$ = 1550KB	1
	Or $(22.05 \times 1000) \times 16 \times (3 \times 60) / 5 / 1000 / 8 = 1588KB$	1
	(ii) <u>Two channels</u> can be used and the song plays lively. / Better sound quality with explanation / surrounding sound (身歷聲) / more realistic / Richer listening experience / * more channels <u>The sound frequency range is broader</u> and music tones can be represented more precisely. / Better sound quality with explanation / more detailed / closer to the original audio * clear voice / It can be converted to the original voice / smoother	1×2
	(d) (i) $1 \text{ Gbps} / 8500 \text{ kbps} = 117.65 = 117$	1×2
	(ii) Process 1: <u>The file size in remains unchanged</u> . The duration will be halved / shorter.	1
	Process 2: The file size in is smaller / halved. The duration will be halved / shorter.	1, 1
4.	(a) (i) D3 D5 D1 D4 D2	4
	1 correct answer → 1 2 correct answers → 2 3 correct answers → 3 5 correct answers → 4 Remark: ignore repeating answers	
	(ii) no typing errors	1
	user friendly	1
	(iii) It stores visitors' identity and so it can speed up the ordering. It stores the previous selected options (toys) so as to suggest other relevant toys for visitors. It stores Session information to authenticate visitors.	1×2
	(b) (i) NUM[pos2] temp	1 1
	(ii) TRUE	1
	4	1
	<> / != / ≠	1
	ALLCORRECT ← FALSE	2
	('return FALSE' ⊕)	

		Marks
3. (a)	$\frac{1111}{\textcircled{1}}$ 1001 1001 1001 1111 ① all correct	2
(b) (i)	$(i - 1) \times n \quad j$ ① with $(i \times n)$ component	2, 1
(ii)	$A[i,j] \leftarrow B[(i-1) \times n + j]$	1
(c) (i)	1001	2
(ii)	2	1
(d) (i)	function / object based top-down / bottom-up implementation approach without / with access modifiers cannot / can overload (other reasonable answers)	1, 1
(ii)	Interpreters: It is convenient for programmers to test and debug during the development of programs. No intermediate object code is generated and hence it takes less memory (efficient). Compilers: The execution time is shorter. The error checking is comprehensive. (other reasonable answers)	1 1
(iii)	Shorten the development time. It has fewer possible program bugs. (other reasonable answers)	1 × 2

Marks
2

4. (a) (i)



(ii) 2 9

1

(iii) maximum of e_1 and e_2
(a,b) or a,b

1

1

(b) $s_2 \leq e_1$ ($s_2 < e_1$ ①)

2

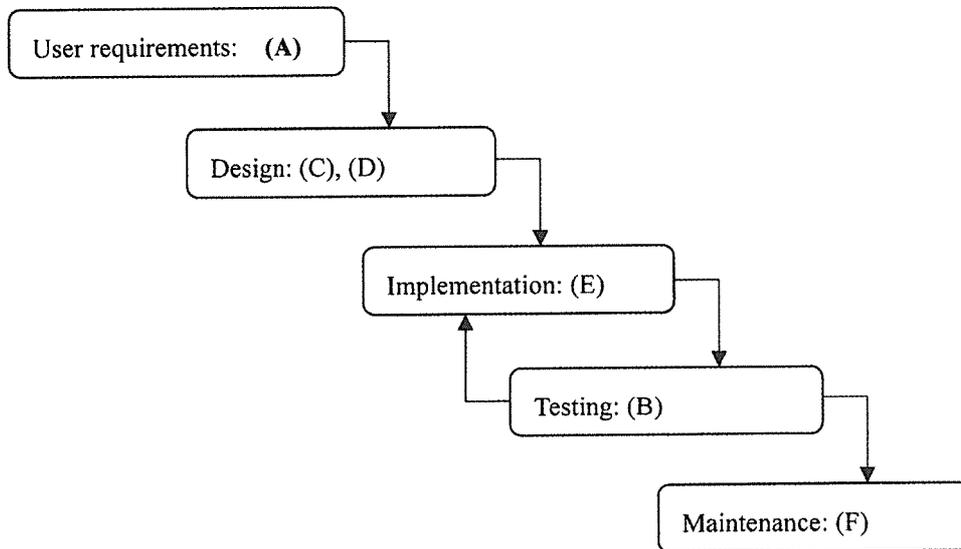
(c) $i < j$
 $MH(L[i].s, L[i].e, L[j].s, L[j].e)$

1, 1

1

(d)

5



Correct tasks in each stage ① × 3

Lines connecting to 'Maintenance' Stage with (F) ①

An arrow from Testing back to a previous stage ①