Paper 1 (Section A)

Question No.	Key	Question No.	Key
1.	D (79%)	21.	D (79%)
2.	A (89%)	22.	C (57%)
3.	A (43%)	23.	A (77%)
4.	B (88%)	24.	B (88%)
5.	A (90%)	25.	C (61%)
6.	C (70%)	26.	C (36%)
7.	B (76%)	27.	B (59%)
8.	C (77%)	28.	A (61%)
9.	D (57%)	29.	D (74%)
10.	A (44%)	30.	B (78%)
11.	A (55%)	31.	C (77%)
12.	C (39%)	32.	B (41%)
13.	A (91%)	33.	A (33%)
14.	B (89%)	34.	B (64%)
15.	D (64%)	35.	A (73%)
16.	D (60%)	36.	D (88%)
17.	B (91%)	37.	C (89%)
18.	A (58%)	38.	D (67%)
19.	D (66%)	39.	B (94%)
20.	C (78%)	40.	C (85%)

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

Paper 1 (Section B)

				Marks
1.	(a)		Benefit: Messages are protected from eavesdropping and interception. (better data security) Drawback: Take time to do the encryption.	1 1
	(b)		The symbols are encoded and sent (text/character) so that the size of the messages (storage required) can be reduced.	1 1
	(c)		Reduce time for file transmission. (network traffic) Reduce data storage needed for the recipient's device. (storage space)	1 1
	(d)		Mary may suffer from a pain in his neck fatigue. (Alternatives: eyes, arms) + She should take a 5-minute break after using the tablet computer for every 30 minutes. / ergonomic-designed furniture	1 + 1
	(e)	(i)	It helps the recovery of users' contact lists/previous messages through the Internet. / The data in the tablet computer can be deleted so as to save its storage space. / Maintain the consistency of data for multiple devices.	1×2
		(ii)	WAPP company may distribute/misuse the contact lists of users for other commercial activities./ WAPP company may reveal users' privacy in their private conversations. / The server will attract more hacking as it has much more privacy information.	1×2
2.	(a)	(i)	The codecs they support are different. / MP4 has a smaller file size. / MP4 is a compressed format. / MP4 has a lower video quality. / MP4 supports streaming. / More portable devices/operating systems support MP4. / HTML5 supports MP4 only. / MP4 supports subtitle/menu.	1×2
		(ii)	System software is used to help manage the hardware resources. It includes operating systems, utility programs and driver programs that provide an interface between hardware and users. ① function ① description / ② two functions	1×2
	(b)		30 × 1024 / 25 = 1228.8 seconds = 20 minutes 30 × 1000 / 25 ✗ ① for answer only (20)	1 1
	(c)	(i)	It can shorten the waiting time to view the videos, because users can watch the videos without downloading the entire files.	1 1
		(ii)	Mr Wong can choose 1280 × 720 (high resolution) to view the videos with high quality. / Mr Wong can choose 240 × 135 (low resolution) to view the videos with a shorter waiting time. ① Choose the option according to the bandwidth/video quality/waiting time. ✗ screen resolution / browser resolution	2*
	(d)		Peter should obtain the permission from the copyright owners of the videos before using them and acknowledge the sources of the videos afterward.	1 1

				Marks
3.	(a)		① Display of all information ① Interactive layout ① Ease of input	3
	(b)	(i)	Flash memory (EEPROM) is non-volatile.	1
		(ii)	Flash memory (EEPROM) is re-writable.	1
	(c)		9	1

	(d)		`X ← 1`
			`Y ← 9`
			`T ← T + W[i]`
				1
				1
				1, 1

	(e)		It is flexible to substitute the index of the respective stations in the algorithm to estimate the travel times for different segments in the route.	1 1
4.	(a)	(i)	Brothers or sisters graduated in the same year may use the same phone number.	1
		(ii)	`CLASS + CLASSNO`	1
	(b)		Character/format/data type check for checking the alphanumeric character at each position / Length check for checking the length of the entered string (presence check) / Check digit / Uniqueness check	1×2
	(c)	(i)	ASCII does not include codes of Chinese characters.	1
		(ii)	There are simplified Chinese characters in the data which can be represented by Unicode. / Unicode includes characters of different languages.	1
		(iii)	As Unicode can store more characters of different languages, more storage capacity should be required in Unicode than that in Big-5 code. / Unicode uses variable-width encoding (1-4 bytes) while Big5 uses 2 bytes only.	1
	(d)		6A 2 6B 2 6C 1 ① exactly 3 items, not necessary in order	2
	(e)		Subject Registration Number sum (total ✕)	1 1 1

			Marks
5.	(a)	HTTP: Browses the shopping web site.	1
		SSL: Do payment on the shopping web site. / Any kind of data that need secure transmission, e.g., personal / sensitive data (member registration, login information) / Secure the data transmission (e.g. HTTPS, SFTP)	1
		SMTP: Send email to the customer services of the shopping web site.	1
	(b) (i)	Senders expect actions and attention from the recipients in 'To'	1
		while the recipients in 'Carbon Copy' receive the messages for information only.	1
	(ii)	The sender has put the email addresses of all recipients in 'bcc'.	1
	(iii)	No translation for the domain name is required. / It is not necessary to own (or purchase) a domain name.	1
		It looks like a phishing web site that customers do not want to visit it. / It is hard to remember the IP address when comparing with a meaningful domain name.	1
	(c) (i)	Password length: long password (8 or more characters) Password content: a combination of characters, numbers and symbols / not a word in dictionary words, not easy-to-guess password Client side : regularly update the password	1×2
		• masking the password in the password field ✗ • a limited number of login trials ✗ • SSL ✗ • security tokens, multi-factor authentication, digital certificate ✗	
	(ii)	Tokens store cryptographic keys (a passcode /a password / a value) to enhance the security on top of the current security measure (e.g. password). It can be in the form of one-time password, hardware device, contactless device, etc.	2
		① what a token is ① process / use	

* Marking criteria
② Illustrate a comprehensive and logical answer
① Illustrate a relevant answer

Paper 2A

Marks

1. (a)

ROUTE	**RID+SN / RID+SID**	**SID**
SPOT	SID	**N/A**

1x3

(b) (i) It can be calculated by the number of records in ROUTE. 1

(ii) It can save computational time in queries. (faster in execution) 1

(c) (i) In ROUTE, it is redundant to store the name of the route in several relevant records as RID is already stored in the table and it can denote RNAME. 1+1
① Observation (RNAME/DIFF) ① Explanation

(ii) SPOT(SID, SNAME) 1
ROUTE(RID, RNAME, DIFF) 1
PATH(SID, RID, SN) 1

(d) (i) It is a form because it is mainly used for collecting data from users. 2*
①

(ii) ① choice of sightseeing spots 3
① Creation of a route comprehensively
① layout design (user-friendly, logical & easy-to-input)

2. (a)
```
UPDATE EW                                                    1
SET AMT = AMT + 100                                          1
WHERE ENO IN(SELECT ENO FROM TRANS                           1
                  WHERE TNO BETWEEN 1 AND 1000)
```

Alternatives: `TNO>=1 AND TNO<=1000`
`TNO>='1' AND TNO<='1000'`

(b) size of a record = 32+16+8+4+8 = 68 bytes 2*
number of records
= 1 MB / 68 bytes ①
= 15,420 ①

(c) (i)

EW ①	TRANS ①
☐	☐
☒	☒
	☒
	☒

1, 1

(ii) When the record with ENO = 'E2' is firstly removed from EW, the corresponding records with ENO ='E2' in TRANS cannot refer to the records with ENO ='E2' in EW. As ENO in TRANS is a foreign key of EW, the corresponding records in TRANS should exist in EW. Hence there will be a referential integrity problem. 2*

(d) The DROP command deletes an entire table instead of rows (records) of a table. 1

The DELETE command will only delete records and the table structure is still there. The records that are removed by the DELETE command can be rolled back. 1

(e) Filter out the relevant records of the customers. 1
Find the trend/pattern/association/relationship (statistical function ✕) such as the sales volume and products sought compared with the other cohorts. 2*

Marks

3. (a)
```
SELECT TITLE, TNAME
FROM PTASK, TEAM
WHERE TEAM.TID = PTASK.FAST
```
① ① 2

(b)
```
SELECT COUNT(*)
FROM PTASK
WHERE TITLE LIKE '%sort%'    (or '*')
```
① ① 2

(c)
```
SELECT TITLE, TNAME, MARK FROM TEAM A, PTASK B, RESULT C
WHERE A.TID = C.TID AND B.PID = C.PID
AND MARK > 50
ORDER BY TITLE ASC, MARK DESC
```
① ① ① ① 4

(d)
```
SELECT TNAME
FROM TEAM
WHERE TID IN
(SELECT FAST FROM PTASK GROUP BY FAST HAVING COUNT(*) > 1)
```
① ① ① ① 4

Alternative:
```
SELECT t.tname
FROM team t
where 1 < (select count(*) from ptask p where t.tid=p.fast)
```
① ① ①

① all correct

(e) (i) S010
S008 (Writing the identity code in order is not necessary) 2

(ii) Check whether a team captain is a member of another team. 1

Marks

4. (a) (i) (1) Eva — 1
(2) Peter — 1

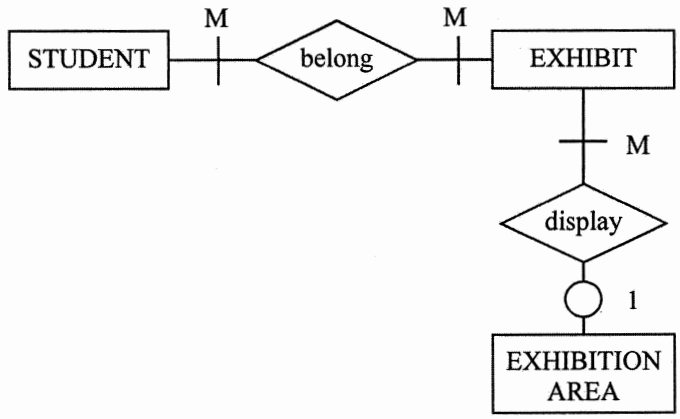
(ii) (1) Database/application design — 1
(2) Testing / coding / maintenance — 1

(b)

End users	Understanding of the operations
Developers	maintenance & testing

1x3

(c) (i) — 4



① entities
①,① cardinality
① M–M
① M–1

4 out of 5 marks

(ii) Theme and identity code (name) of the exhibition area — 1, 1
✕ location of exhibition area, number of exhibits

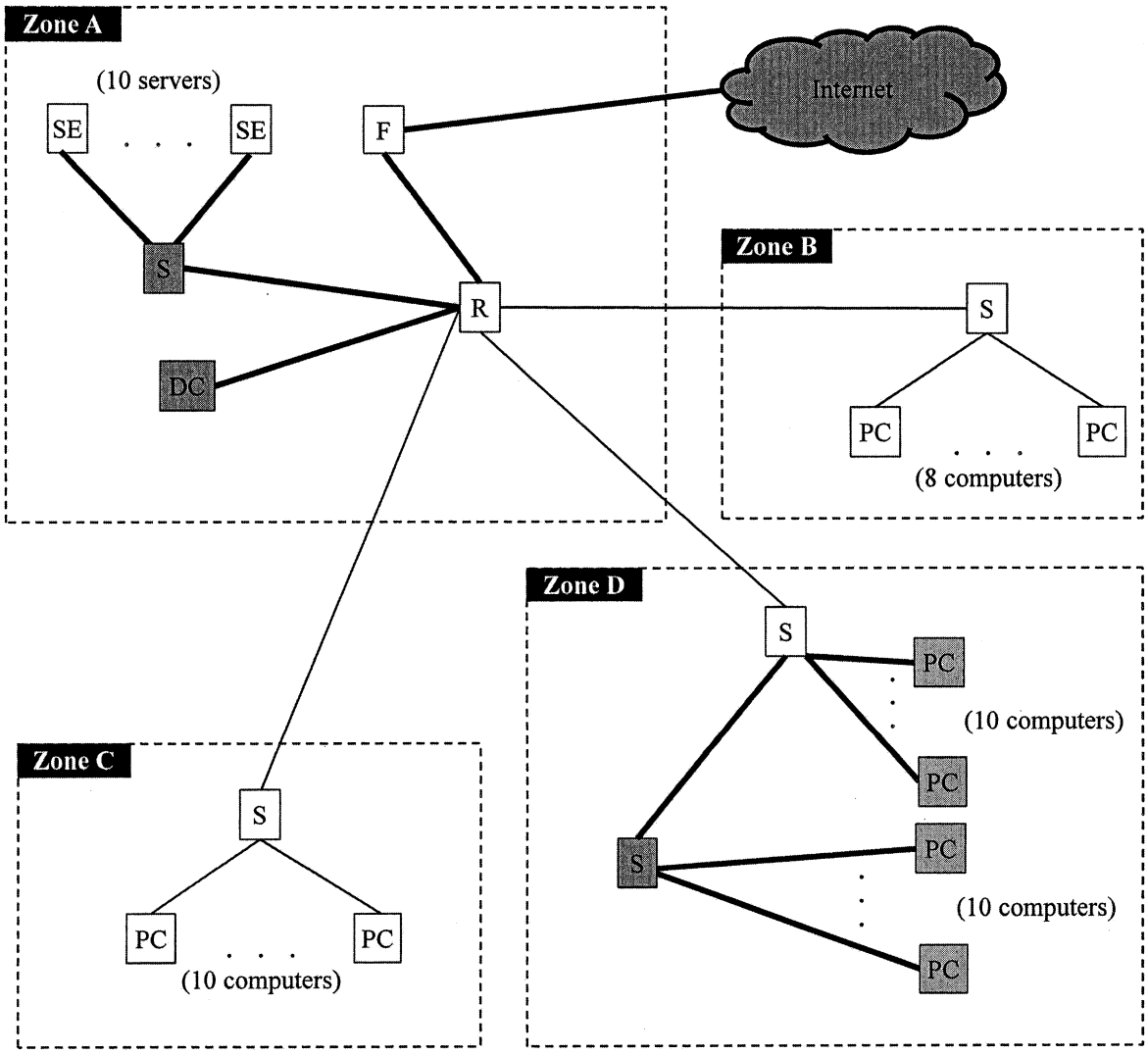
(d) Challenges related to: — 1x3
storage size for the multimedia elements, shared memory/storage issue, concurrency/integration control, bandwidth for transferring multimedia elements, processing time for video streaming

* Marking criteria
② Illustrate a comprehensive and logical answer
① Illustrate a relevant answer

				Marks
3.	(a)	(i)	① understanding of duplex communication mode ① advantage (simultaneous communication)	1 1
		(ii)	① understanding of synchronous transmission ① advantage (lower overhead/higher throughput)	1 1
		(iii)	① understanding of circuit switching ① advantage (a dedicated connection)	1 1
	(b)	(i)	source address, destination address, length of the packet, checksum, identification tag, priority (Quality of Service), hop count/TTL (Time to live), port number	1×3
		(ii)	A checksum will be calculated for error checking. The data packets are reassembled in the correct order.	1 1
	(c)	(i)	1024 – 40 = 984 bytes	1
		(ii)	2 × 1024 × 1024 / 984 = 2132 packets	2
		(iii)	(2132 × 1024 × 8) / (1000 × 1000) = 17.5 s	2
4.	(a)	(i)	There are fewer hosts in a LAN. / The coverage of a LAN is smaller. / The complexity of a LAN is simpler.	1
		(ii)	Provide a better routing control between zones. / Connect the four different subnets.	1
	(b)		Network logon, access control	1×2
	(c)	(i)	256/4 – 2 = 62	1 1
		(ii)	255.255.255.192	1

Marks

(d) ② the switch in Zone A, connecting to the router and the 10 servers * 8
② a domain controller in Zone A, connecting to the switch *
② the firewall in Zone A, connecting to the Internet and the router *
① two switches in Zone D
① all 20 computers well connecting to the switches



* Marking criteria
② Illustrate a comprehensive and logical answer
① Illustrate a relevant answer

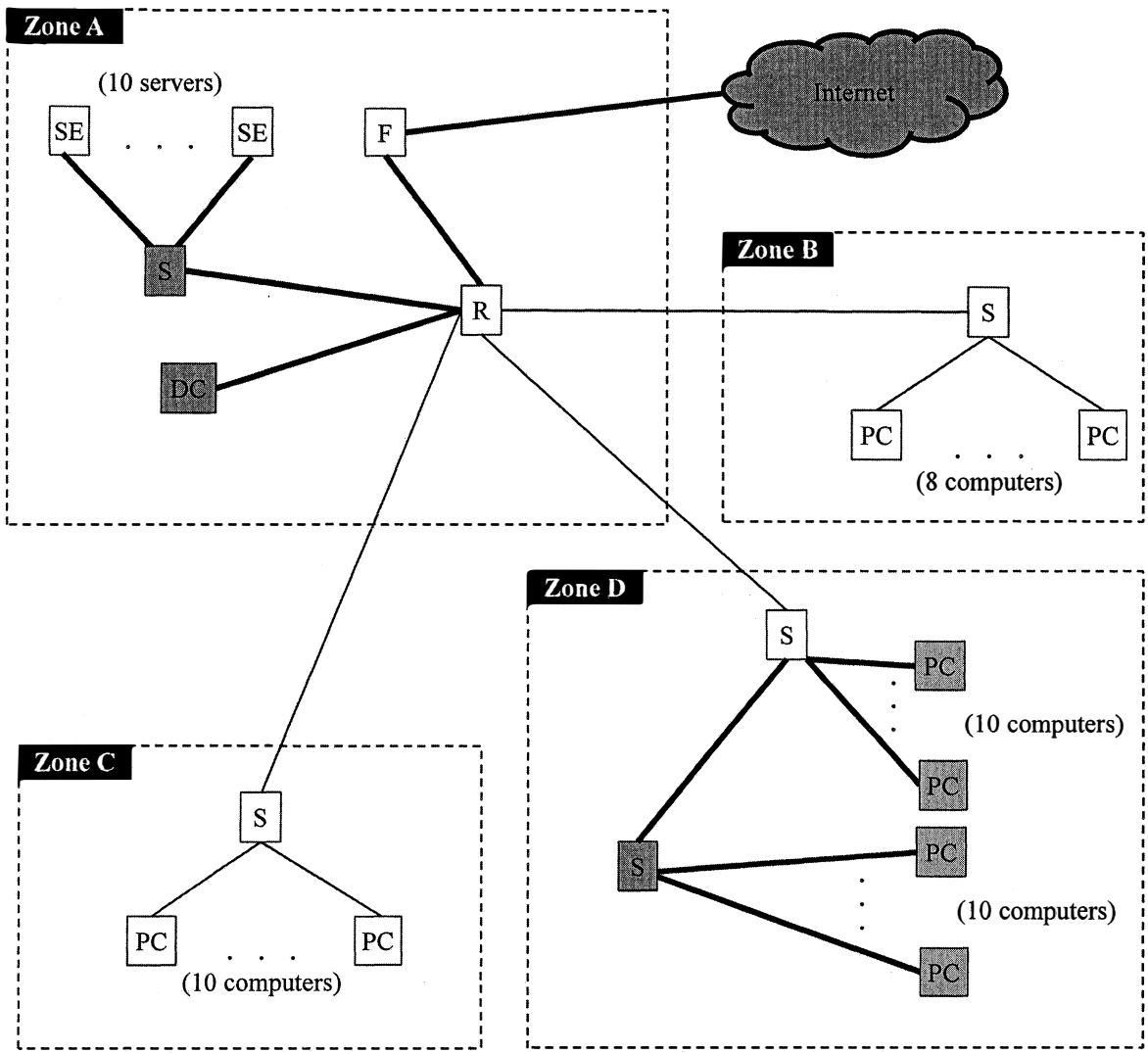
Paper 2B

			Marks
1.	(a)	It is fibre optics because it supports the transmission for a very long distance.	1+1
	(b) (i)	X – switch Y – router Z – firewall	1×3
	(ii)	Block unauthorised access from the Internet. / Prevent hacking.	1
	(c)	Hardware control (NIC) / MAC filtering Software control (single login)	1 1
	(d)	Set the same SSID. Set the same security method/password.	1 1
	(e) (i)	Provide temporary power supply for the server. Provide a steady power supply for the server.	1×2
	(ii)	Database server	1
	(iii)	Mr Li should create backup of important data. / Mr Li should shut down the server/database services properly.	1
2.	(a) (i)	500 × 8 / 50 ① = 80 s	2*
	(ii)	1024 × 8 / 100 ① = 82 s (or 80 s)	2*
	(b)	There is a network interruption/interference in the coffee shop. A maximum bandwidth is set. More than one device are connected to the network. Alternatives: Overheads / Poor reception of the network signal due to an unstable connection / Network devices in a location with poor reception / obstacles	1×3
	(c) (i)	(1) Staff computer (2) Staff computer and home computer	1 1
	(ii)	VPN channel / Encryption ✗ Anti-eavesdropping device	1
	(d) (i)	Design A: The router can first scan through the incoming message so as to ① reduce the loading of the proxy server. ① Or Design B: The proxy server can hide the IP addresses of the devices ① so as to provide higher security level for the network. ①	2
	(ii)	It temporarily stores some web pages once a network user has visited. (recently visited) When other network users visit the web pages, they can directly access those stored in the proxy server rather than downloading the web pages through the Internet again, leading to saving time on download. (speed of access)	2*
	(iii)	Filter indecent web sites. / Record browsing history.	1

				Marks
3.	(a)	(i)	① understanding of duplex communication mode ① advantage (simultaneous communication)	1 1
		(ii)	① understanding of synchronous transmission ① advantage (lower overhead/higher throughput)	1 1
		(iii)	① understanding of circuit switching ① advantage (a dedicated connection)	1 1
	(b)	(i)	source address, destination address, length of the packet, checksum, identification tag, priority (Quality of Service), hop count/TTL (Time to live), port number	1×3
		(ii)	A checksum will be calculated for error checking. The data packets are reassembled in the correct order.	1 1
	(c)	(i)	1024 – 40 = 984 bytes	1
		(ii)	2 × 1024 × 1024 / 984 = 2132 packets	2
		(iii)	(2132 × 1024 × 8) / (1000 × 1000) = 17.5 s	2
4.	(a)	(i)	There are fewer hosts in a LAN. / The coverage of a LAN is smaller. / The complexity of a LAN is simpler.	1
		(ii)	Provide a better routing control between zones. / Connect the four different subnets.	1
	(b)		Network logon, access control	1×2
	(c)	(i)	256/4 – 2 = 62	1 1
		(ii)	255.255.255.192	1

Marks

(d) ② the switch in Zone A, connecting to the router and the 10 servers * 8
② a domain controller in Zone A, connecting to the switch *
② the firewall in Zone A, connecting to the Internet and the router *
① two switches in Zone D
① all 20 computers well connecting to the switches



* Marking criteria
② Illustrate a comprehensive and logical answer
① Illustrate a relevant answer

Paper 2C

Marks

1. (a) (i) 3:2 — 1

(ii) 600dpi: — 1+1
$8 \times 600 = 4800$
$10 \times 600 = 6000$
2400dpi:
$8 \times 2400 = 19200$
$10 \times 2400 = 24000$
600 dpi should be chosen for the photos with the resolution 5472×3648. Otherwise, the printouts of the photos on the 8R photo paper would be very small for using 2400dpi.

Note: No calculation is required.
600dpi – larger printout / print quickly ×
2400dpi – better quality ×

(b) GIF supports 8-bit colour depth while SWF supports 24-bit colour depth. (colour depth) — 1×3
SWF supports interactive animation. (user input)
SWF supports audio/video.
GIF is bitmap graphic while SWF is vector graphic.
A plug-in is required for SWF.

(SWF refers to Flash and GIF refers to animated GIF. ×)

(c) Toggle the colours of the image of the company name and — 1
put the image on the top of the image of the camera figure. (copy the image of company name and paste it on the image of the camera figure) — 1

(d) (i) Different versions of web browsers are used in the two computers. / — 1
There is a missing font type in a computer.

(ii) Convert the text as an image. / Recommend a version of web browser for best view. / — 1
Recommend users to install a particular font type on their computers. /
Use CSS to control the font type.

(e) The contents and compositions of the photos are different. — 1
With the same compression method, the compositions of the compressed data of the photos are different. (e.g. the number of colours) / After compression, the file sizes of the photos with simple shapes and colour combination are smaller. — 1

(f) (i) Keep most data of the image. / No compression is applied. — 1
(Better quality ×)

(ii) No dedicated software is needed for viewing TIFF files as TIFF is basically compatible with most operating systems and photo editing applications. / — 1
Since data in TIFF is already in an editable format, no conversion is needed before editing and hence it has faster post processing. /
Its metadata is fully editable. / It can contain multiple images. /TIFF can maintain layers.
(contain metadata / no compression ×)

			Marks
2.	(a)	44.1 × 1000 × 16 / 8 × 2 × 60 / 1024 / 1024 ① = 10 MB	2
	(b) (i)	Musical notes are editable. (It is easy to change instruments/notes.) Input musical notes directly in a computer and there is no need to invite musicians to play the instruments. The file has a smaller file size. There is no need to process human voice.	1×2
	(ii)	Use an electronic instrument (MIDI input) such as a digital piano to record the school song and then edit the musical instrument/notes accordingly. / Use MIDI editing software to input musical notes to compose the school song.	1
	(c)	Reduce the sampling rate. Reduce the number of channels. Reduce the sampling size. Increase the compression ratio.	1×2
	(d)	Display the scroll bar / menu bar / status bar / toolbar / title bar / address field (location) / Set the position (top, left) / Make it resizable	1×3
	(e) (i)	Embed the audio HTML code on the page for the upper/lower frame in Web Page A.	1
	(ii)	Embed the audio HTML code on the page for the lower frame in Web Page A and set the attribute 'loop'.	1
	(iii)	Embed the audio HTML code on the page that will be redirected after login.	1
	(iv)	Embed the audio HTML code on the page for the upper frame in Web Page A.	1
3.	(a)	Services using both user locations and cinema locations: Find the closest cinemas. Suggest routes to cinemas (time/distance/navigation). Navigation purposes (Suitable language settings, street view, finding user/cinema location only, checking cinemas for available seats. ×)	1×2
	(b) (i)	Server-side script -The data of the available seats is stored in the database in the server. (Concept of server-side ① + explanation ①) (Explanation about buying tickets such as updating the seats in database ×)	1+1
	(ii)	Client-side script - The checking/response time on the client-side is shorter. / Reduce the server loading. (Concept of client-side ① + explanation ①) (Checking the number of tickets is correct. / Server-side scripts are not needed. / Checking can be done by a browser only. / Higher efficiency. ×)	1+1

Marks

(c) (i) Iris scanning (iris), retinal scanning (retina), hand geometry (hand), palm veins (palm), voice/speech, facial recognition (face) 1

(pupil, eye ×)

(ii) Use a board with 4×4 dots. (more than 9 dots) / 1
Set a minimum number of dots to be connected. /
Hide the drawn lines.

(Add passwords or other forms of authentication. / Use more complicated patterns. ×)

(iii) Hackers cannot get the password by acquiring mouse click locations. / by hand movement / 1
Make sure that user is human / it is not a robot program.

(Stop key logger / hacker cannot keep trying login / it is difficult to get the password / increase security ×)

(d) ① Clearly display of thumbnails 3
e.g. suitable resolution for thumbnails / enlarge selected thumbnails for clear display

① user-friendly navigation
- Use suitable navigation menu (e.g. movie names, small thumbnails, Back & Next button) /
- Use one scrollbar or scrolling in one direction only (horizontal or vertical)

① Description of the use
- effective layout to arrange thumbnails and movie information
(movie information is shown when a thumbnail is clicked /
movie information is shown in new page when a thumbnail is clicked ×)

(e) ① Available seats: 3
- Suitable design (e.g. symbol, legend) to show available or unavailable seats /
- Suitable description to alert users that the seats are available or taken by others

① Illustrate how to select seats:
- Suitable design for simple seat selection (by clicking) (e.g. Zoom in button / Scrolling)
(Menu/textbox for selecting the seats ×)

① show selected seats
- Suitable design for displaying seats (display selected seat clearly, e.g. seat numbers/symbols in seating plan)

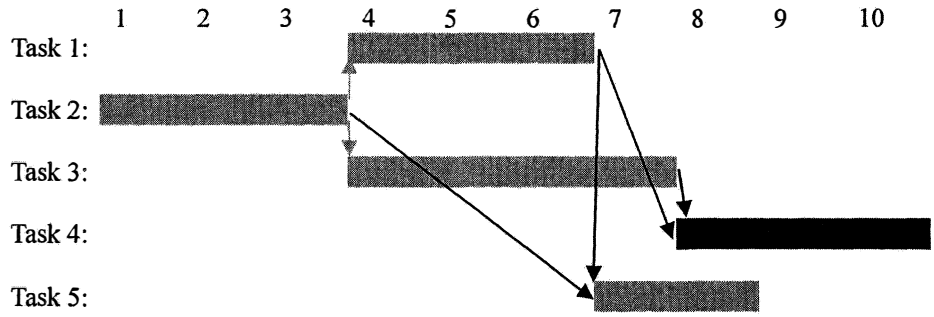
				Marks
4.	(a)	(i)	Grouping, use of submenu	1,1
		(ii)	- accessibility issues, ways to acquire the information (speech-to-text software) - shorter loading time - easier to edit the labels of the buttons - enhance searching (by keywords)	2*
	(b)	(i)	Keywords of the web page are added to a meta tag to increase the chance of being searched by search engines. Character encoding is added to a meta tag to direct the character encoding to be used for the display. (Alternatives: description of the web page, title, author, copyright, creation date, modification date, date of the latest update, refreshing web page, re-direction)	1×2
		(ii)	Record the banner ads that were shown in the past so that other new banner ads can be shown for the next visit. (Record a piece of information ① + use for the next visit ①)	1+1
	(c)		For each part of a tooth, create an area (a polygon) on the image and assign the corresponding hyperlink to that area. (Create an area ① + assign a link ①)	1+1
	(d)	(i)	The aspect ratios of videos and the screens are different.	1
		(ii)	$\underline{20} \times 1024 \times 1024 \times 1024 / (\underline{25 \times 24 \times 1280 \times 720} / 8)$ ① $= 311$ (289-311)	1, 1
	(e)		① check the correctness of the questions (if statement) ① accumulate the number of 'yes' ① loop for 10 times ① display the health condition according to the number of 'yes'	4

* Marking criteria
② Illustrate a comprehensive and logical answer
① Illustrate a relevant answer

Paper 2D

Marks

1. (a) (i)



① Task 4
① only 1 arrow correct / ② all arrows correct

(ii) Task 2 → Task 3 → Task 4

(iii) 10

(b) (i)

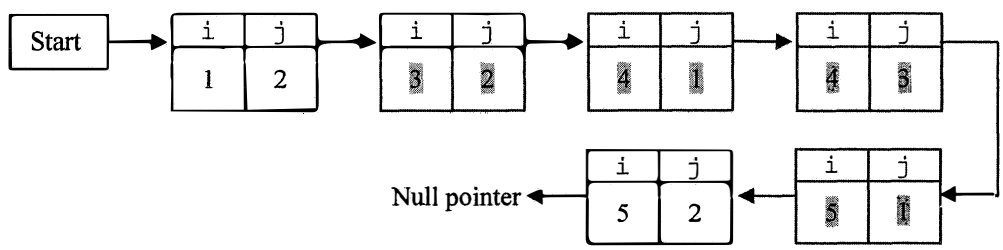
	1	2	3	4	5
1	F	T	F	F	F
2	F	F	F	F	F
3	F	**T**	F	F	F
4	**T**	F	**T**	F	F
5	**T**	**T**	F	F	F

2

① 1 or 2 mistakes
② all correct

(ii)
```
for i from 1 to 5                                              1
  for j from 1 to 5                                            1
    if M[i,j] = T
       print the dependency: Task i depends on Task j          1
```

(c) 3



Note: The order of the nodes is not necessary.

(d) (i) Users are easier to use the GUI.
The GUI has a better outlook.

(ii) Pointer (mouse pointer) / cursor 1
Icon / window / menu / button / image 1

Marks

2. (a) ① C4 — 1
② C5 — 1
③ C3 — 1
④ Yes ⑤ No — 1

(b) (i)

1	2	3	4	5	6
3	8	5	1	4	9

— 2

(ii)

1	2	3	4	5	6
1	3	4	5	8	9

— 1

(iii) Sorting values in `A` in increasing order — 1

(c) 8 — 2

(d) (i) The values in array A are in increasing order and distinct. (use the example in (b) or (c) ✓) — 1

(ii) The values in array A are in decreasing order and distinct. (use the example in (b) or (c) ✓) — 1

(e) The execution time for a complied language is usually short than that for an interpreted language. / — 1×2
Optimisation could be done during the compilation stage. /
No source code is needed. /
Translation can be done once only.

3. (a) (i)
```
POP S1
PUSH S2
```
— 1

(ii)
```
POP S2
PUSH S1
```
— 1

(iii) No action — 1

(b) A notification will be issued. — 1

Alternative: Remove the bottommost element of `S2`
```
POP S1
PUSH S2
```

(c) order of the three components (unit testing ➔ system testing ➔ acceptance testing) — 1
use of each component — 1×3

(d) (i) Object-oriented language: C# — 1
Non object-oriented language: Fortran — 1

(ii) Description of the following criteria: — 1×3

- Scale and modularity
- Reusability
- Portability
- Execution efficiency
- Functional strengths
- Readability
- Utility libraries and development tools
- End-user interaction
- Familiarity
- Cost

Marks

4. (a) 3 — 1

(b) `a` `b` ① `i+a-1` `j+b-1` ① — 4

`FALSE` ①

`TRUE` ①

(c) (i) `K = 1 + 2 + 4 + 16 = 23` — 1

(ii) 1 — 1

```
y ← 1                    1
K + Multiple             1
Multiple * 2             1
```

Alternative 1:

```
0                  ①
y ← 1              ①
K + 2^Multiple     ①
Multiple + 1       ①
```

Alternative 2:

```
y ← 1              ①
K + 2^(i-1)        ③
```

(d) (i) 4 — 1

(ii) Calculate the `K` value of `P` and match it with the values in `B2` and count the number of `K` values. — 1, 1

(e) (i) 24 — 1

(ii) No: — 2*

Sorting is required before doing the binary search. / Extra memory storage is required. /
Binary search cannot handle multiple occurrences.
Hence, in general, the work done for sorting outreaches the work done for sequential search.

Yes:
B2 is transformed into an array to which the binary search can be applied. Hence it increases the efficiency of the searching or pattern matching.

* Marking criteria
② Illustrate a comprehensive and logical answer
① Illustrate a relevant answer