Paper 1 (Section A)

Question No.	Key	Question No.	Key
1.	C (74%)	21.	B (79%)
2.	D (53%)	22.	D (33%)
3.	A (78%)	23.	B (81%)
4.	C (61%)	24.	C (91%)
5.	D (91%)	25.	D (62%)
6.	B (79%)	26.	B (78%)
7.	A (64%)	27.	B (83%)
8.	B (41%)	28.	D (90%)
9.	A (39%)	29.	C (65%)
10.	B (58%)	30.	A (69%)
11.	D (73%)	31.	C (68%)
12.	D (73%)	32.	B (73%)
13.	A (53%)	33.	D (75%)
14.	A (83%)	34.	C (70%)
15.	C (47%)	35.	D (69%)
16.	C (51%)	36.	C (68%)
17.	B (55%)	37.	B (80%)
18.	A (60%)	38.	D (71%)
19.	A (62%)	39.	A (84%)
20.	D (73%)	40.	C (26%)

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

Marks

1. (a) Format check / length check / presence check / unique check , OR
proper description of the validation 1

Range check / check digit ✘

(b) Wong Ka Ka
Chan Tai Man

① correct record + ① correct field 1+1
(follow the actual display; no mark for 1-line display with two names)

(c) (i) ABS
'ABS' may not match with the field type in the table. (data type mismatch) / 1
data type of the field will also accept some other character input and increase difficulty of data validation (data validation) /
Problem will occur when doing arithmetical calculation (calculation)
(can describe the problem out) /
Need more storage space (storage)

ZERO (0) 1
0 will be mixed up with those who have got no marks.

(ii) Before doing arithmetical calculation (e.g. calculating average mark), '-1' should be ①identified 1+1
and ①discarded. (MEASURE AT CALCULATION) /
①input -1 as text (adding " ' " before -1) to ① avoid involving it in calculation   (MEASURE AT INPUT)

(d) (i) M2D 1

(ii) =COUNTIF($E$2:$E$101, CONCATENATE(B$103, $A104)) 1,1
① (E2:E101)   ① (B103)

① addressing (all $ correct) 1

E2:E101
Accept E:E / E1:E101

84

2. (a)

System software	Application software
usually written by low level languages	usually written by high level languages
maintain system resources for application software	run on the platform provided by system software
Interaction with application software	Interaction with users
general purpose software used for operating computer hardware	specific purpose software used by user to perform specific task

(b) $A \leftarrow B$

$B \leftarrow T$

1
1

(c) (i)

A	B
6	9
3	6
0	3

1
1
1

(ii) 1

1

(d) While (A $\leq$ 0) <u>or</u> (B $\leq$ 0) do   ① $\leq$ ① or

1,1

(e) B←<u>Remainder of B/A</u>   or   <u>B-A</u>

A←<u>Remainder of A/B</u>   or   <u>A-B</u>

1
1

			Marks
(a)	(i)	MP4 supports a smaller file size of video.	1
	(ii)	$10 \times 60 \times 24 / 1024$	1
		$= 14.0625$ GB	1
	(iii)	Concept of data packets (division of data / resemble of packets)	1
		Use of IP address (IP address to destination / routing)	1
	(iv)	Media format	1×2
		Compression ratio for video and audio (bitrate)	
		Frame size (video resolution) (including aspect ratio)	
		Frame rate	
		Network bandwidth	
		(Acceptable answer: encoding scheme / codec)	
(b)		The lighting system should be set to a <u>suitable brightness</u> to reduce visual discomfort.	1×2
		The curtains and/or the lighting system should be set to avoid the monitor to <u>reflect</u> the light.	
(c)	(i)	face recognition, iris / eye vein / retinal scan, hand geometry (fingerprint / palmprint), palm vein, wave forms of voice (voice / ear acoustics)	1
	(ii)	Need to bring along the smart card.	1×2
		Doctors may lose the smart card.	
		Another non-holder may use the smart card to enter the room. / duplication	

			Marks
4. (a)	(i)	Switch / hub	1
	(ii)	Price searching (database access)	1×2
		Store the transaction (data storage)	
		Deduct the item count (database update)	
		Calculation for transactions(computation)	
		Connection with the printers in the terminals/kitchen (communication)	
(b)	(i)	Minimise the input errors.	1
		Increase the efficiency of input. (or description of the user-friendliness)	1
	(ii)	Proper arrangement of 20/26 items (e.g. by page, by category, by sorting)	1
		Provide quantity input properly (e.g $\ominus$ 0 $\oplus$)	1
(c)		Fast in printing	1×2
		No need to replace toner	
		Smaller in size	
(d)	(i)	Less manpower on terminals	1×2
		More technical staff for the maintenance of the kiosks	
		More staff on customer service	
	(ii)	The service is streamlined and enjoy a better customers' experience. / Shorter waiting time for ordering food/ Suitable for speech impaired customers	1

5. (a)

(b) (i)

(ii) 00001000 10000011, 11111111
     └─────────┬─────────┘   ①
               ①

(iii) 127

(c) (i) RAM should be used as it is volatile and its content can be over-written.

(ii) Memory size needed by Method 1 <= Memory size needed by Method 2
    Method 1 = 200 bytes, Method 2 = 200 bytes or 400 bytes
    Reasonable explanation

(iii) Method 2 needs fewer computer resources.
    Whenever there are <u>any three or more repeated rows to be displayed,</u> only two-bit patterns are needed. It saves <u>storage space</u> to represent the content.

    Or

    Method 1 needs fewer computer resources.
    Method 1 is <u>simple in structure</u> and saves the <u>computational power/time</u>.

MID + VID + RDATE   (or comma)

Marks

1. (a) SELECT MID, MNAME FROM MEMBER
WHERE CREDIT < 100 and MTYPE = "O"

2

(b)

1

1

(c)

SELECT SUM(RFEE) FROM VIDEO, RENTAL
WHERE VIDEO.VID = RENTAL.VID AND
VTITLE = "Nice Face"

1

1

1

SELECT VIDEO.VTITLE FROM VIDEO

(d) WHERE VIDEO.VID NOT IN
(SELECT VID FROM RENTAL)

1

1

1

Or

SELECT VTITLE
FROM VIDEO LEFT OUTER JOIN RENTAL ON
VIDEO.VID = RENTAL.VID
WHERE RDATE IS NULL

(e) UPDATE MEMBER
SET CREDIT = CREDIT + 50
WHERE YEAR(JDATE) < 2017

1

1

1

(f) List the identity codes of the <u>gold members</u>
who joined the membership earlier than all ordinary members.

1

1

(a) Some identity codes of food in D1 and D2 are the same.

They can be masked before migrating to the final database table. (correction)   1+1

The data type of prices of food in D1 and D2 are different.

The corresponding field in the final database table should be in *real* type. (correction)   1+1

(b)

①,① cardinality

①,① M-1

4
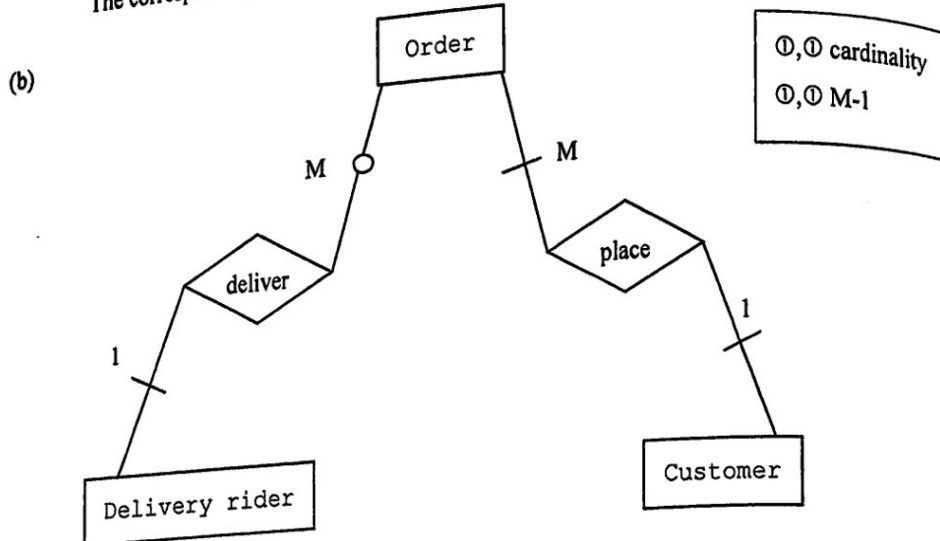
(c) appropriate data item(s) from the order form   1

utilize the data to conduct analysis / estimation / calculation of the data item(s)   1

description of improvement   1

(d) a search function on date (a specific date range)   1+1

with appropriate user-friendly design features (e.g. calendar input)

a search function on district   1+1

with appropriate user-friendly design features (e.g. drop-down menu)

3. (a) `char(7) primary key`
`integer / char / numeric`

Alternative:

`char(7) primary key` ✓
`char(7) NOT NULL primary key` ✓
`char(7) NOT NULL unique` ✓
`char(7) unique primary key` ✓
`char(7) NOT NULL unique primary key` ✓

`char(7) unique` ✗
`char(7) NOT NULL` ✗

(b) (i) No, SID+CLNO is not a candidate key for STUDENT as the primary key has one field while it has two fields (more fields than the primary key/it is not minimal).

(SID is the primary key ①)

2*

(ii) CL+CLNO

Avoid a composite key for lower search performance. / change every year

1+1

(c) NAME: Null values are not allowed.

SEX: only 1 character can be stored.

1+1
1+1

(d) Assume ACODE = Type code, TYPE = (music, sports, visits), ADESP = (basketball ....)

5

STUDENT(SID, NAME, SEX, CL CLNO) ①
~~Foreign key: N/A~~

ACT(ACODE, TYPE) ①
~~Foreign key: N/A~~

DESP(ADESP, ACODE) ①
Foreign key: ACODE ①

ST_ACT(SID, ADESP, DATE, R##) ①
Foreign key: SID, ADESP ①

Record ID

Attribute & primary key ①

For each table,
Attribute / primary key /
Foreign key ①
All correct ①

5 out of 6

4. (a) (i) Query editor: Stage 3, 4, or 5

a logical description of designing queries related to the stated stage

2

Graphical tool: Stage 2, 3, 4 or 5

a logical description of drawing ER diagram / GUI (testing) related to the stated stage

2

① brief description

2

(ii) test plan

testing data preparation

data validation on results

1×2

(b) (i) There are more rows generated by SQL2 as they are duplicates while there are no duplicates generated by SQL1.

2

(ii) DELETE should be used as it removes all the records

while DROP will remove the entire table.

1

(iii) SQL1: 7   3

SQL3: 5   6

1

3

(iv) Show data on the two malls at the same time/row

Compare the amounts of records with the same MID from the two malls

Illustrate data in order grouped by MID

1×2

Maintain all the data from the two tables (malls' datasets) as SQL1 may lose data. (missing duplicated records)

* Marking criteria

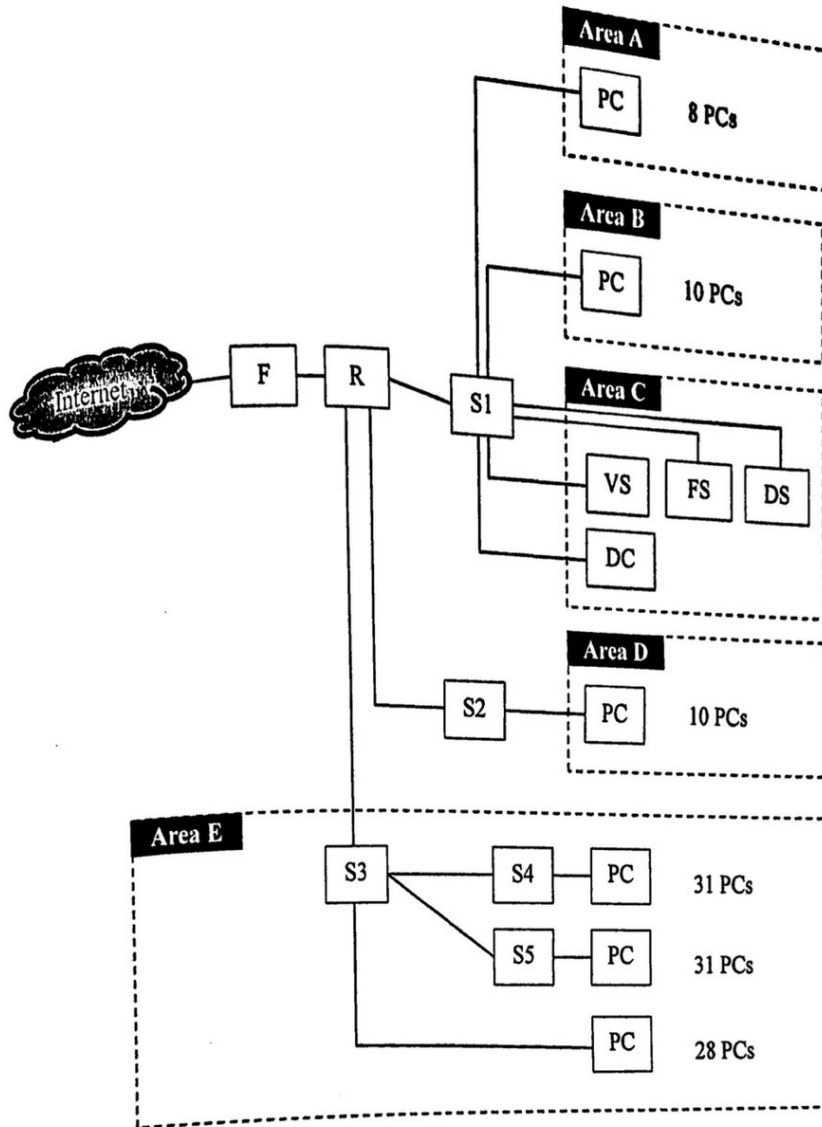② Illustrate a comprehensive and logical answer

① Illustrate a relevant answer

1. (a) (i) Bluetooth
It has low power consumption / better security for transferring the physiological readings / no need to be in direct line of sight.

Marks

1+1

(ii) RFID
It is more efficient (no authentication etc) to read the identity information of a number of the elderly people around the nursing home.

1+1

(iii) RFID / Bluetooth
It is simple and fast to access the door.

1+1

(b) low bandwidth requirement, low power consumption, no advanced setup, no extra space/extra hardware devices needed (Bluetooth only), secured network as authorisation is needed before use

1×2

(c) wireless keyboard/mouse & computer + description / smartphone & earbud + description

1+1

(d) RAID:
① Read-Write actions are spread across different disks thus ①improve the performance of disk access , OR

1,1

① Provide instant backup of data in the server to ① minimize the impact on data loss when hard disk failure.

UPS:
① Provide a temporary power supply for the server ① when power outrage (shut down) /
① Provide a steady power supply for the server to ① avoid unstable electricity supply.

1,1

2. (a) (i) Number of connections, bandwidth, obstacles/wall, frequency, interference by the environment, area of coverage

1×3

(ii) Check the channel to ensure being clear before sending a packet. ①
Otherwise wait for a random period of time (backoff factor/backoff counter). ①
The steps are repeated until all packets are sent.

2*

(b) (i) It is used to support roaming.

1

(ii) It is much easier to troubleshoot/manage the wireless network with APs in different SSIDs.
(different access rights/connect to different subnets)

1

(iii) It is used for private (e.g. CCTV network) to minimise the network attack / better security

1

(c) It encrypts data and decrypts encrypted messages during data transmission.

1

(d) MAC address filter + description (or suitable description only)

1+1

(e) (i) It sets the ① rules and ① formats for data transmission in wireless networks and hence the data transmission can start and end accordingly.

1,1

(ii) Bandwidth (Speed), frequency, interference, coverage, MIMO (Stream), power consumption

1×2

3. (a) Any two nodes can ① communicate with each other (2 ways), but ① not simultaneously

   (b) Yes
       No
       No

   (c) This is a ring topology. The transmission is ① unidirectional. When a node is under maintenance, ① no message can be sent through it. The communication between two nodes will be broken.

   (d) (i) <u>D1</u>
       IP address range: 192.168.1.1 – 192.168.1.254
       Subnet mask: 255.255.255.0

       <u>D2</u>
       IP address range: 192.168.2.1 – 192.168.2.254
       Subnet mask: 255.255.255.0

       (ii) <u>D1a</u>
       IP address range: 192.168.1.1 – 192.168.1.126
       Subnet mask: 255.255.255.128

       <u>D1b</u>
       IP address range: 192.168.1.129 – 192.168.1.254
       Subnet mask: 255.255.255.128

   (e) Better security
       Better resource management

4. (a) Easy setup
       Users can manage the share of resource directly

   (b) Access Management / Security Control
       Resource Management

   (c) security, loading, network management (control)

(d)

Area A — PC — 8 PCs

Area B — PC — 10 PCs

Internet — F — R — S1

Area C — VS — FS — DS — DC

Area D — S2 — PC — 10 PCs

Area E — S3 — S4 — PC — 31 PCs — S5 — PC — 31 PCs — PC — 28 PCs

Firewall
DC connected to S1
Servers connected to S1
PC at E connected to 3 switches and ...
port arrangement of the 3 switches at E
Sum of PC at E is 90
S1 switch connected to A, B, R / F
S2 switch connected to D and S1

1×2

(e)   email server, DHCP server, web server, print server, proxy server, DNS server, FTP server, application server, virtual server

* Marking criteria

② Illustrate a comprehensive and logical answer

① Illustrate a relevant answer

1. (a) (i) $1920 \times 1080 \times 24 \times (2 \times 60 \times 60) \times 24$ ▓▓▓ $(8 \times 1024 \times 1024 \times 1024)$

$= 1001$▓ GB   1

Ans: 1001.13 ~ 1074.95 (1000, 1001 ~ 1075)   1

(ii) $44.1k \times 16 (2 \times 60 \times 60) \times 2$ ▓▓▓ $(8 \times 1024 \times 1024 \times 1024)$

$= 1.18$ GB   1

Ans: 1.18 ~ 1.27   1

(b)

Scenario	Mode
The video involves fast moving objects.	5
The quality of still images captured from the video is the best.	4
The video file size is smallest.	2

1
1
1

(0 marks for more than one answer)

(c) (i) Viewers can preview the video for a few seconds (1), when mouse is over the thumbnail of a video. (1)   (1+1)×

Viewers can have a basic understanding of the video, when mouse is over the thumbnail of a video, the information of the video is shown. (1)

Mouse over + wheel rotate → enlarge / reduce video size ✗

(ii) Analyse lists of videos that viewers likes or dislikes, (use of figures) /   1×2

Put popular videos in the front / put related videos on the same page /

provide a recommended list of related videos.

(iii) A cookie can store the preferences of the viewer (e.g. language setting). When visiting the web page, the web page accesses the cookie and provides web content corresponding to the viewer's preferences.   1,1

(Restore where the video was paused last time)

(The example should be related to video)

Font type ✗

(a) (i) AI / ai

Marks

(ii) When enlarging the images, there is no distortion on the edges. 1
The file size is smaller for images with lines and shapes only. /
The file size is smaller generally / in most cases. 1

Vector graphics is represented by mathematical expression ✘ (It is a property, not an advantage) 1
vector graphics is easy to be edited ✘ (acceptable only if the situation is clearly stated)

(iii) Flip the arrow (image 3) horizontally. / mirror function / reverse
Rotate/Resize the rectangle (image 1).
Place the circle (image 2) as the bottommost layer. 1
1
No procedural sequence required 1

Corresponding action except for the "circle". Arranging other objects' layers can also get the
same result.

In brief, layers order (from bottom to top) is circle (image 2), rectangle (image 1), arrow (image
3)

"arrow" change from left to right ✘

(b) (i) sharpening (contrast), colour saturation, gamma correction 1×2

(ii) ① Select (precisely) the human figure by using selection tools. 1
① Save the figure as a transparency layer with the use of transparency rubbers. 1
Cut/Copy and paste the layout into Photo 1

① Adjust / resize / move the layout to the left lower bottom to fit in Photo 1 1

(c) (i) 16:10 / 8:5 1

(ii) 4800 × 3000 / (16 × 300) × (10 × 300) / 14,400,000 1

(d) RGB: 3 primary colours: red, green, blue vs CMYK: 4 primary colours: cyan, magenta, yellow, 1, 1
black
They are different colour models used in different appliances, RGB: monitor vs CMYK: printer
RGB: combine all to create white (light) vs CMY: combine CMY to create black colour
(printing)

Feature of one colour model, RGB or CMYK ①

The other corresponding feature ①

3. (a) Provide pull-down menus to select a location.
Provide a map with labelled centres for users to select a location.
Provide 'smart' search to autocorrect the input text.
Provide a validation check (location) and alert message before submission.
Provide a validation check (location) and alert message before submission.
Suggest relevant locations about the input while a user is typing.
Provide radio buttons/checkboxes to select a location.

(b) C2: A suitable user-friendly input component to allow multiple selections in facility, e.g.
① A design that allows multiple selections (more than one)

    Checkboxes
    A list that allows multiple selections
    A multiple selection menu
    A button to add facilities
① A user-friendly input design

1+1

C3: A suitable user-friendly design in search results to facilitate the selection, e.g.
① A design that facilitates further selection in search results

    A sorted list in search results
    Further filtering in search results
    Additional reasonable criteria in the search page to reduce the number of entries in the results,
    E.g. Time of booking / extra facilities (air conditioner) / nearby facilities
① A user-friendly input design

1+1

C4: A suitable design to input a date range, e.g.
① A design that includes a date range for input

    Begin date + end date
    Begin date + number of days
    Date picker (allow a date range)
① An improved user-friendly input design, e.g. A well-design menu to choose a date easily
    (calendar, slider)

1+1

(c) Better Format:
It has much wider presentation capabilities. / enriched formatting features / examples of better formatting of CSS that cannot be done by pure HTML easily (e.g. image filters, access online font, animated effects, font styles)

1×2

Layout:
It provides much better control/standard over the layout / apply a better layout / responsive web pages

External style sheets
Benefit of external style sheets / same styles:
Unify the styles/layouts/interface of multiple webpages
Facilitate the adjustment of the styles/layouts/interface in multiple webpages
Apply ready-made style sheets for some reasonable purpose (e.g. reduce the time to design, unify the styles throughout the website.)

(d) (i) Transmission
① Alert users that information sent and received with that page is not encrypted / no SSL / not HTTPS

① It could potentially be stolen, read, or modified by hackers as the data transferred are not encrypted / The data is stolen during the transmission / input / The transmission is intercepted.

Marks

1,1

OR

Identity of web site
① There is no digital certificate in the web site / e-Cert.
① Identify of website is not verified by Certificate Authority / phishing website

(ii) ① Features in the web site (not user computer): digital certificates / e-Cert get certificate for CA
① Explain: SSL / HTTPS / encrypt the data / verify the identity of web site to users

1,1

(a) (i) <u>Server-side</u>: The usernames are stored in a <u>database</u> / the <u>server</u>.

1

(ii) <u>Client-side</u>: The validation can be carried out by a client-side script and it <u>releases the workload of the server</u>.

1

(iii) <u>Server-side</u>: The validation can be carried out by the server as <u>the JavaScript function in the browser setting might be disabled</u>.

1

(b) (i) Prevent <u>robot</u> machines from creating multiple trial entries. /
Provide frictionless verification for human beings whilst <u>hard on bots</u>. /
<u>Ensure that the client is a human being</u>, not a robot program

1

(ii) Provide Audio Captcha
(suggested measure should not forfeit the purpose of captcha)

1

(iii) Image identification, puzzle, map moving letters,
asking questions like 'how many hours in a day' / simple math questions,
slider captcha, checkbox captcha, reCaptcha

1

(c) (i) Provide a magnified glass to enlarge the content pointed by the mouse pointer. /
Provide alternative text of the images and use text-to-speech software to read out the numbers.

1,1

① suggestion (a suitable web design feature)
① description (assist visually impaired players to play this game)

(ii) MyRand   ✓ MyRand()

                   ✗ 1 - 100 random number

    $N > 3$ ✓ $N \geq 4$, $N \geq 4$, $N = 4$ 1

    $LN \leftarrow G + 1$ ✓ $LN = G + 1$

                    ✗ $LN \leftarrow G$ 1

    $HN \leftarrow G - 1$ ✓ $HN = G - 1$

                    ✗ $HN \leftarrow G$ 1

    $A = G$ ✓ G equal to A   1

                    ✓ $G == A$

                    ✗ A = MyRand (not related to the input G)

                    ✗ G = MyRand (value will be change)   1

                    ✗ G equal to user N's input

                    ✗ Guessing answer

    N

(d)   lack of 24-hour system maintenance/ support/   1

        lack of appropriate hardware or firewall/

        no proper technical support /   1

        low security level of the home-used server and easy to be hacked

        Third-party host company / Cloud service

                                                      1

Marks

Marks

2

1. (a)
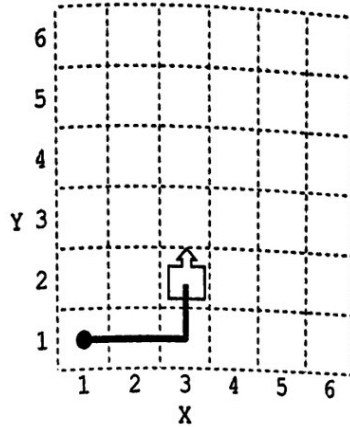
Path and final position ①
All correct   ①

3

(b)
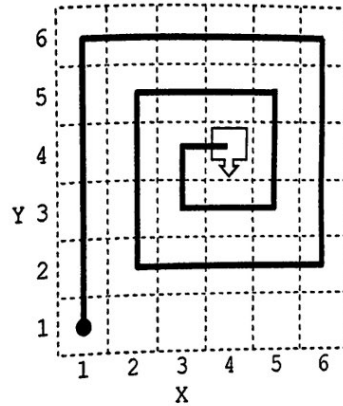
First 2 lines (@ (6,6))   ①
Full path   ①
All correct   ①

1

(c) (i) TW or tw

2

(ii) (5-dir) mod 4

Alternatives:
IIF(dir<=1, 1-dir, 5-dir)
dir<=1? 1-dir : 5-dir
(or other valid methods)

Consider the following 4 possible values of dir and check the result of the expression:

dir	Result of expression	
0	1	①
1	0	
2	3	
3	2	

All correct   ①

100

(d)   NX >▮ X

     |NX - X| ① NX - X

     NY >▮ Y

     |NY - Y| ① NY - Y   S

                   ① all absolute values

(e)   Schedule of individual tasks in the project – manage the start date and end date / duration / schedule of each task.

Dependency between tasks – manage the dependency between tasks (or the critical path of the project).   (e.g. MOVE, project integration)   1

                                                               1

2. (a) (i) 11

      (ii) 90   1

(b) (i)   2

7	8	9	10	11	12	13	14
T	T	T	T	F	T	T	T

                                                        1

      (ii) FC2 is more efficient because FC1 includes a nested loop.

          ①   1+1

      (iii) N-1

           A[j]-S

           N-1

           i+S   3

           Note: Two (N-1) ①

(c) (i) The sum of the N consecutive numbers / Sum of S to S+N-1

                                                                     1

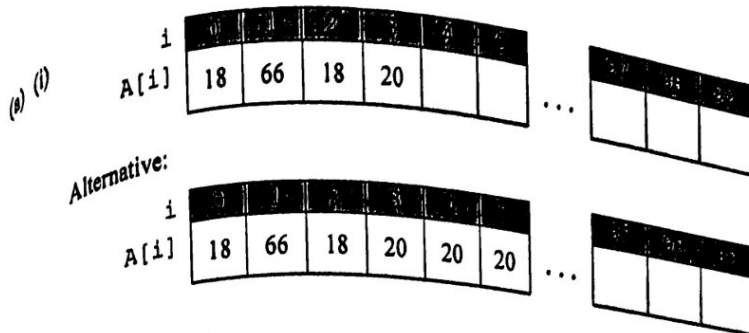   (ii) The sum of the (N-1) consecutive numbers minus the missing number / Sum of A[0] to A[N-2]

                                                                  1

      (iii) It has a shorter execution time.

                                                                  1

      (iv) It uses fewer memory.

                                                                  1

(d)   FC3

                                                                    1

        If the two missing numbers are 9 and 10, the output is 19. However, 8 and 11 could be the two missing numbers and hence no conclusion can be made. (other reasonable example using numbers between 5 and 14 inclusive) 1
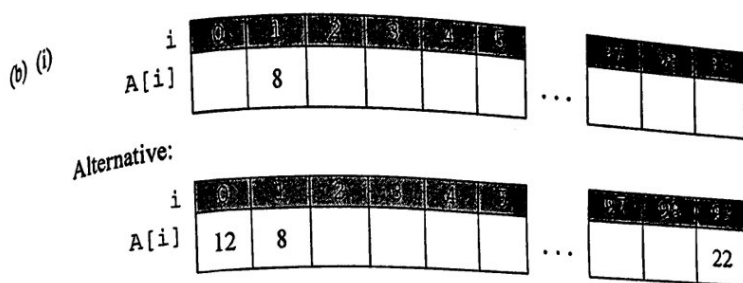
(a) (i)

i	0	1	2	3	4	5		97	98	99
A[i]	18	66	18	20			…			

Alternative:

i	0	1	2	3	4	5		97	98	99
A[i]	18	66	18	20	20	20	…			

Marks 2

(ii)
```
if N = 0 then
      return TRUE
else
      return FALSE
```
return true only if N = 0 ①
return false for other cases ①

1
1

Alternative:
```
Return (N=0)
```

(b) (i)

i	0	1	2	3	4	5		97	98	99
A[i]		8					…			

1

Alternative:

i	0	1	2	3	4	5		97	98	99
A[i]	12	8					…			22

(ii) 1

1

(iii) 1

1

(c)
```
if (H+N-1) <= 99 then
      return H+N-1
else
      return H+N-101
```

4

Award marks according to the following 4 test cases:

Case	H	N	tail(Q)	Mark
When tail(Q) > H	0	99	98	1
When tail(Q) < H and N = 2	99	2	0	1
When tail(Q) < H and Q is full	99	100	98	1
When tail(Q) = H and N = 1	99	1	99	1

2

(d)
```
if H = 99 then
      H ← 0
else
      H ← H + 1
```

Award marks according to the following 2 test cases:

Case	Input H	Updated H	Mark
1	99	0	1
2	98	99	1

No marks for changing values of other variables

1+1

(e) In deq, when the first item is removed, there is no need to move the remaining items.
deq / first item removed ①
Elaboration of the implementation of deq ①

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4. **(a)** **(i)** Concept of:

Object (attributes and methods)
Data abstraction (common features of objects & procedures)
Class (modularity and reusability)
Encapsulation
Information hiding (reduction of complexity)
Inheritance (relationship between different classes)
Polymorphism

(ii) Description of the following criteria:

Scale and modularity
Reusability
Portability
Execution efficiency
Functional strengths
Readability
Utility libraries and development tools
End-user interaction
Familiarity
Licensing fee for using libraries (other reasonable cost)

(b) Integration/system test – ensure that modules in a system are compatible with each other and produce consistent data and output.
User acceptance test – ensure that the design meets users' requirement.

1

(c) Direct cutover conversion – save cost on managing the old system. / no need to manage two systems at a time.
Pilot conversion – minimise the impacts on change.

(d) Adding/improving more functions/features
Fixing program bugs
Making changes in compliance with the updates on OS/device drivers/software
Improving the security of the system
Improving the efficiency of the system