DSE Information and Communication Technology

Suggested Answer (English Version)

Paper 1A

Question No.	Key	Question No.	Key
1.	B	21.	B
2.	D	22.	A
3.	A	23.	B
4.	D	24.	B
5.	A	25.	C
6.	C	26.	A
7.	A	27.	A
8.	A	28.	A
9.	C	29.	B
10.	D	30.	D
11.	B	31.	B
12.	D	32.	C
13.	D	33.	D
14.	A	34.	A
15.	C	35.	D
16.	B	36.	B
17.	A	37.	B
18.	B	38.	A
19.	D	39.	D
20.	C	40.	D

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.

Paper 1B

Marks

1. (a) Advantage: Chatbots can generate the summaries of search results / can combine information from different sources and generate summaries, making information results easier to understand / chatbots can offer more personalised content — 1, 1

   Disadvantage: Chatbots may experience hallucination issues, where they incorrectly paraphrase source information or generate inaccurate content

   (b) Whether the training data of chatbot is provided from authoritative/ reliable sources — 1×2
   Whether the training data of chatbot is the latest information and not being outdated or not
   Volume of training data (Quantity of training data)
   Variety of training data (source of training data)

2. (a) (i) Manage the data transmission between the computer and the transmission media (radio frequencies) / manage data transmission between the computer and the network — 1

   (ii) Connecting wireless devices to a wired network / provide wireless connection to form a wireless LAN — 1

   (iii) Wi-Fi might not be encrypted, leading to a higher possibility of being eavesdropped by hackers / subjected to a man-in-the-middle attack / Network traffic might be monitored and recorded by the coffee shop, threatening data privacy / It might be easy to connect to a fake Wi-Fi hotspot set up by hackers (evil twin attack) — 1×2

3. (a) Float — 1

   (b) Crop 23.33
   Tree 25 — 1, 1

   ① GROUP BY (2 rows with correct Type)
   ① All correct

   (c) Databases are more efficient for extracting data through SQL, especially when there is a large amount of data / Databases can store a large amount of data / Better data validation can be implemented; for example, we can implement uniqueness checks on IDs by setting an ID as a primary key in the database — 1

4. (a) Let the upload bandwidth by x Mbps — 2
   $(1.5\times1024\times1024\times1024\times8)\times20$ / $x \times 1000\times1000 = 2\times60$
   $x = 2147.484$
   Minimum upload bandwidth = 2147.484 Mbps

   ① Correct formula
   ① Correct answer (including correct unit)

   ✕ without unit

   (b) (i) Students encrypt their videos using students' private key — 1,1
   School / Teachers decrypts students' videos using students' public key

Marks

× answers without mentioning whose key
× answers without using keywords e.g., "encrypt" and "decrypt" ("upload" and "read" are not accepted)

(ii) It is more difficult for hackers to crack the encryption system through brute force attack. 1

× takes longer time to decrypt

5. (a) Computer A 1 + 1

GPU: Dedicated GPU / graphic card improves the performance of parallel processing, which reduces the time for model training
CPU: Higher clock rate / The number of cores is higher, which speeds up the time for executing the instructions on data processing / model training
RAM: It has larger RAM capacity, which enables users to store more temporary data for machine learning

① Correct computer
① Correct specification

× better CPU without mentioning the specification (e.g., clock rate / number of core)
× Computer B (higher bandwidth / larger storage space)

(b) Computer B 1 + 1

Ports: USB 3.0 has a higher data transfer rate than that of USB 2.0. It enhances the data transfer rate of transferring videos from the camera to the computer.

Network (wired); Higher bandwidth in wired connection (2 Gbps LAN) enhances the network speed (data transfer rate) of uploading videos to the Internet

Network (wireless): More latest Wi-Fi standard (802.11ax) usually with higher bandwidth in wireless connection, which improves the network speed (data transfer rate) for uploading videos to the Internet

① Correct computer
① Correct specification

Marks

6. 5 6 9 6 1 4
i = 0

5 6 9 6 1 4
i = 1

5 6 9 6 1 4
i = 2

-1 mark for each mistake 3

7. (a) =SUMIF(Sales!$D$2:$D$7, "<="&Total!A2, Sales!$D$2:$D$7) 3
① ① ① ①

Any two of the following:
① Correct function (SUMIF)
① Correct cell range (D$2:D$7)
① Correct cross referencing (Sales!)
① "<="&

For the third mark:
① All correct

(b) ROW: `TYPE` 1

VALUES: COUNT of `TYPE` / `ArtworkID` / `SalesPrice` (Other reasonable answers) 1

(c) (i) Desktop computers and mobile phones have different screen sizes / different aspect ratios / different input methods / different Internet connection speeds 1

(ii) The file format of image / the resolution of the image / the aspect ratio of the image 1

(d) Provide user interface 1×2
Resource management (memory management / network management / device management)

(e) Advantage: It saves storage space / reduces transmission time when transferring files 2

╳ higher transmission speed

Disadvantage: Her colleague needs to decompress the file before opening it, which requires more time to open the spreadsheet file / Her colleague might need to install extra software to decompress the file

╳ answers related to lossy compression (e.g., lower quality)

8. (a) More information can be provided (e.g., food label/ nutrition label in different languages) / Video (e.g., advertising videos on other drinks) can be provided / Information can be updated easily 1×2

╳ lower cost (without specifying the type of cost e.g., printing cost)
╳ more environmentally friendly

(b) Integer. The number of drinks needs to be sold at a discrete value / cannot be a decimal number. 1

╳ correct answer but without explanation
╳ float

Marks

╳ numeric (numeric includes both integer and float)
╳ array (array is a data structure, not a data type)

(c) (i) It determines whether the array sales are sorted in ascending order / It determines whether there is a daily sales figure lower than the previous day 1

It determines whether the array sales is not sorted in ascending order / It determines whether the sales figure each day is non-decreasing

╳ without mentioning sorting order
╳ It determine whether the array is not sorted in descending order

(ii) ALG1 has higher readability on the iteration. 1

╳ ALG1 has higher execution efficiency / ALG1 requires fewer storage space

(iii) Line 3 1

```
while i < 6 AND A = False do
```
1

(d) (i) 2 1

(ii) Version 1 5

```
[Python Version]
longest = 1
current = 1
for i in range(0, 6):
  if sales[i+1] > sales[i]:
    current = current + 1
    if current > longest:
      longest = current
  else:
    current = 1

[C++ Version]
int longest = 1;
int current = 1;
for (int i = 0; i < 6; i = i+1) {
    if (sales[i + 1] > sales[i]) {
        current = current + 1;
        if (current > longest) {
            longest = current; }
    } else {
        current = 1; }  }
```

Version 2

```
[Python Version]
longest = 1
current = 1

for i in range(0, 6):
  if sales[i+1] < sales[i]:
    current = 1
  else:
    current = current + 1
    if current > longest:
       longest = current
```

Marks

```
[C++ Version]
int longest = 1;
int current = 1;
for (int i = 0; i < 6; ++i) {
    if (sales[i + 1] < sales[i]) {
        current = 1;
    } else {
        current = current + 1;
        if (current > longest) {
            longest = current; } } }
```

Any 4 of the following:
① Correct for loop (`range(0, 6)` /`range(0, len(sales)-1)`)
① Correct if-statement
① Correct increment of current
① Correct reset of current
① Correct update of longest

① All correct (correct syntax except minor mistakes)

Minor mistakes include:
1. Missing colon (:) after for and if in Python
2. Missing semi-colon (;) after a statement in C++ / Pascal
3. Case sensitivity is not considered

No marks will be given to answers written in Pseudocode

9. (a) $2^n \geq 310$ 2
$n \geq 15.8$
=> 16 bits are needed

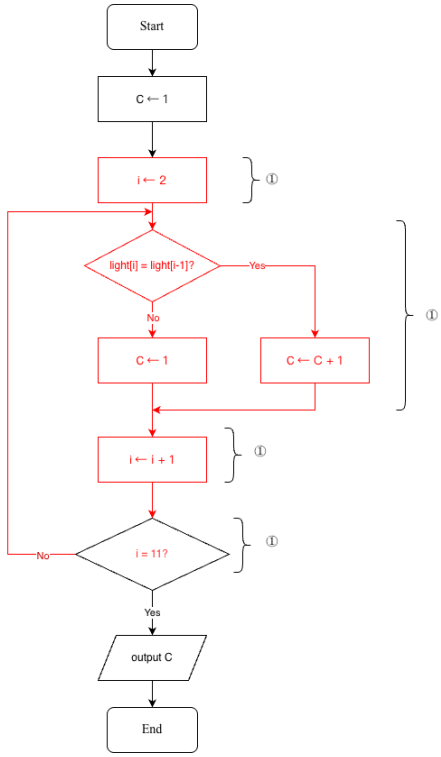
Alternative answer:
$2^n \geq 3$
$n \geq 1.58$
2 bits is needed for each light blub

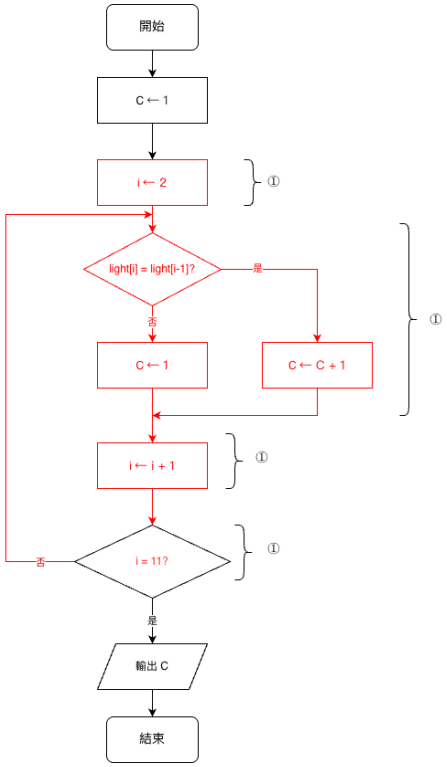
2 x 10 = 20 bits needed for the entire light system

① correct formula
① correct answer

(b) Green / G 1

(c) Marks 4





Marking criteria:
① initialise `i` (`i ← 2`)
① correct decision (`if`)
① increment of `i` (`i ← i + 1`)
① Correct decision (`i > 10` / `i = 11`)

Reference: Pseudocode version of post-test loop

```
C ← 1
i ← 2
repeat
    if light[i-1] = light[i]
        C ← C + 1
    else
        C ← 1
     i ← i + 1
until i = 11

output i
```

```
C ← 1
i ← 2
重覆
    如果 light[i-1] = light[i]
        C ← C + 1
    否則
        C ← 1
     i ← i + 1
直至 i = 11
```

(d) (i) R G B R G B R G B R
R G R G R G R G R G
(Any other reasonable answer) 1

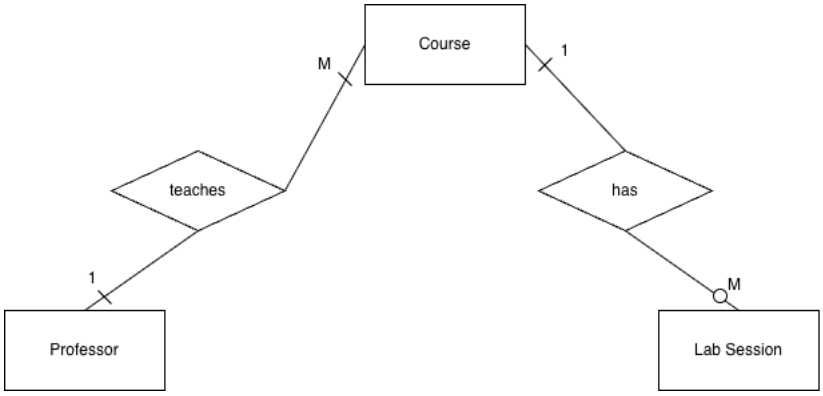
(ii) Run-time error 1 + 1
The index used to access elements in comp is out of range

╳ overflow error
① correct explanation but improper name / incorrect name of program error

(e)
```
if idx >= 9 then
  exit the loop
```
1
1

Paper 2

Marks

1. 

4

Marking criteria:
① relationship (either one)
①,① 1:M
①,① cardinality
4 out of 5

2. (a) `TicketID, SeatNum, ConcertID` 1

(b) `ConcertID` 1

(c) `ConcertID, ConcertName, Date, Performer, VenueID` 1

(d) `VenueID` 1

(e) `N/A` 1

3. (a) 2

```
SELECT * FROM LOAN
WHERE StudentID = 'S202501' AND BOOKID = 'B0777';
                  ①                    ①
```

(b) 2

```
CREATE INDEX idx_student_book
ON LOAN(STUDENTID, BOOKID);
                  ①
```

① Composite index
① All correct

4. (a) `DELETE FROM CLASS` removes all records inside the database table 1
`DROP TABLE CLASS` removes the entire database table

╳ Answers that do not <u>mention both</u> `DELETE` and `DROP`

(b) `UNION` removes the duplicated rows. 1
`UNION ALL` keeps the duplicated rows.

╳ Answers that do not <u>mention both</u> `UNION` and `UNION ALL`

Marks

(c) 2

```
S101
S103
```

① Any one of the records
① All correct

Deduct 1 mark for comma separating each record e.g., `S101, S103`

5. (a) 2

```
SELECT CustName
FROM CUSTOMER
WHERE YEAR(RegDate) = 2023;
       ①              ①
```

(b) 2

```
SELECT ProdName
FROM PRODUCT P, SALES S
WHERE S.ProdID = P.ProdID and CustID = 'C1024';
                ①                    ①
```

(c) 2

```
SELECT ProdName
FROM PRODUCT
WHERE ProdID NOT IN (SELECT ProdID FROM SALES);
                                  ①
```

① All correct

(d) 3

```
SELECT Category, SUM(Quantity)
FROM PRODUCT P, SALES S
WHERE P.ProdID = S.ProdID            ①
GROUP BY Category                    ①
HAVING SUM(Quantity) > 500;          ①
```

(e) It lists the names and prices of products that are more expensive than the average price of products within their own category. 2

(f) Sequence B 2*

There will be referential integrity as CustID of "C9002" in SALES cannot be identified / referenced in the CustID of CUSTOMER.

① Correct Sequence (Sequence B)
① Correct explanation

Marks

6. Input Control for Searching e.g. badge buttons, filters, price slider 3
Multimedia elements inc. text, audio, video

7. (a) Advantage: Reduce manual workload / improve accuracy 1
Limitation: Some devices need static IP address, e.g. file server 1

(b) Default gateway, subnet mask 1×2

8. (a) Wider bandwidth / better stability / larger coverage 1

(b) TCP: Ensure data integrity 1
UDP: Smaller overhead / lower latency 1

9. (a) (i) Users may not know the clickable areas / poor mobile optimisation / potential accessibility issues 1

(ii) Yes. We can use an event listener for mouse click and redirect the user to another web page. 1

(b) Self-hosting: Better flexibility (Full control for configuration) 1

Hosting service: Simpler set up 1

10. (a) To indicate that HTML5 should be used. 1
(Accept any description regarding new functions in HTML 5)

(b) Update Date / Author / Description / Created Date 1×2

(c) The external CSS may contain extra styles which affected the style of h1. 1

(d) type="number" 1

(e) (i) The file can be embedded to other web pages of the same web site. 1
(Modularity / Programme-data Independence)

(ii) (1) `$i + 1` 1
(2) `$MOVIES[$i]` 1

(f) (i)
```
const ADULT_PRICE = 100;
const CONCESS_PRICE = 50;
const totalPrice = ADULT_PRICE * numberOfAdult +
                   CONCESS_PRICE * numberOfConcession;
```
2

① One mistake
② All correct

(ii) keyup / keydown / keypress / changed / blur / input 1
╳ click / focus

(iii) It is a form of user interaction which can only be achieved on the client. 1

(g) (i) (1) `$fields as $field` 1
(2) `$values . $field . ", "` 1

(ii) To redirect the user to the web page `success.php`. 1

Marks

11. (a) 2

```
isFull(S)
   return len(S) = 8      ①
```

(b) Stack underflow when it is not full. 1
Description of corresponding solution 1

12. (a) (1) `j ← i + 1` 1
(2) `A[j] < A[j - 1]` 1
(3) `i >= N - 1  /  i = N - 1` 1

(b) Quick sort / Merge sort 1

13. (a) 1 / SC[5, 0] 1

(b) ① Correct Percentage or Correct Asterisk 1+1
① All Correct

[Python Version]

```
def star(per):
    cnt = 0
    total_score = 0
    N = 7
    for i in range(N):
        if SC[i][per] != -1:
            total_score += SC[i][per]
        if SC[i][per] >= 5:
            cnt += 1
    star = ""
    if cnt >= 3:
        star = "*"
    print("{}{}: {:.2f}".format(per, star, total_score/(N - 1)))
```

[C++ Version]

```
void star(int per) {
    int cnt = 0;
    int total_score = 0;
    const int N = 7;
    char star = '\0';
    for (int i = 0; i < N; i++) {
        if (SC[i][per] != -1) {
            total_score += SC[i][per];
        }
        if (SC[i][per] >= 5) {
            cnt += 1;
        }
    }

    if (cnt >= 3) {
        star = '*';
    }

    std::cout << per << star << ": " << std::setprecision(3) <<
(float)total_score / (N - 1) << std::endl;
}
```

Marks

(c) (i) Notice for any values of i and j, pair(i, j) == pair(j, i). Therefore, when (i == bi) > (j == bj), pair(bi, bj) must be equal to pair(i, j). The IF statement in line 50 must be false. 1

(ii) `FOR j FROM i+1 TO 6 DO / FOR j FROM i TO 6 DO /`
`FOR j FROM 0 TO i DO` 1

14. (a) (1) `InsArr[i].dir = 'E'` 1
(2) `dy + InsArr[i].dis` 1

(b) Ultrasonic Sensor / Infrared Sensor 1

15. (a) 4.3 1

(b) ① Finding maximum
① Accumulation
① All Correct 3

[Python Version]

```
max_S = S[0]
for i in range(1, C):
    if S[i] > max_S:
       max_S = S[i]

cnt = 0
for i in range(0, C):
    if S[i] == max_S:
       cnt += 1

print(cnt)
```

[C++ Version]

```
double max_S = S[0];

for (int i = 1; i < C; i++) {
    if (S[i] > max_S) {
            max_S = S[i]; } }

int cnt = 0;

for (int i = 0; i < C; i++) {
    if (S[i] == max_S) {
            cnt += 1;  }    }

std::cout << cnt << std::endl;
```

(c) (i) ① Iteration
① Loop
① All Correct 3

[Pseudocode]

```
isExist ← False
FOR j FROM 0 TO size - 1 DO
    IF arr[i] = el THEN
        isExist ← True
RETURN isExist
```

Marks

(ii) NX[i] may be out of bound when there is a duplicated element in N. 1
Line 70: NX[size - 1] ← N[i] 1

(iii) Instead of using the function in (c)(i), we can check N[i - 1] to see if the same value exists. 2*

(d) ① Loop 1+1
① All Correct

[Python Version]

```
def getAverage(T):
    cnt = 0
    total = 0
    for i in range(0, C):
        if N[i] == T:
            cnt += 1
            total += S[i]
    return total/cnt
```

[C++ Version]

```
double getAverage(std::string T) {
    int cnt = 0;
    double total = 0;

    for (int i = 0; i < C; i++) {
        if (S[i] == T) {
            cnt += 1;
            total += N[i];
        }
    }

    return total / cnt;
}
```

(e) Advantage: Shorter insertion/deletion time 1
Disadvantage: Only support sequential access / Requires more memory space 1