

There are 40 questions in this paper. Choose the most suitable answers.

1. Which of the following statements about two's complement is/are correct?

- (1) Overflow errors will not occur in arithmetic operations.
- (2) The maximum value for an 8-bit number is 0111 1111.
- (3) The minimum value for an 8-bit number is 1111 1111.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

2. Peter creates a school newsletter and posts it on a web page. The newsletter is in portable document format (PDF) instead of word document format because

- (1) hyperlinks can be included.
- (2) the newsletter will be displayed in the same way on any device.
- (3) the resolution of images in the newsletter will be higher.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

3. In order for a factory manager to decide on the number of machines to be bought to produce pencils, he needs to consider time and cost constraints. What spreadsheet feature should he use to do this?

- A. Pivot table
- B. Multiple worksheets
- C. 'What-if' analysis
- D. Sorting data using multiple criteria

4. Mary uses a text editor to enter the following 5 traditional Chinese characters and saves them in a text file. The file size is 10 bytes.

世 上 無 難 事

Which of the following statements about the text file is/are correct?

- (1) Each Chinese character occupies 2 bytes.
- (2) ASCII code is used to represent the characters.
- (3) The text file does not support Big-5 code.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

5. The file sizes of the following original files are all 10 MB. After converting them, which converted file has the smallest file size, under normal circumstances?

	<u>Original file</u>	<u>Converted file</u>
A.	testA.MP4	testA.AVI
B.	testB.MP3	testB.WAV
C.	testC.BMP	testC.JPG
D.	testD.GIF	testD.BMP

Answer Questions 6 and 7 with reference to the following database table STUDENT.

STUDENT		
NAME	SID	CLASS
John Ho	18110	1A
Mary Li	09544	2C
Peter Wong	17623	3B
Greg Li	06308	2A
:		

6. What is/are the possible data type(s) for SID in STUDENT?

- (1) Integer
- (2) Character
- (3) Boolean

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

7. STUDENT is exported into a spreadsheet. What spreadsheet feature produces a similar output to executing the following SQL command in a DBMS tool?

```
SELECT CLASS, COUNT(*)
FROM STUDENT
GROUP BY CLASS
```

- A. Sorting
- B. Cell references in formulas
- C. Object Linking and Embedding
- D. Pivot table

8. Eva creates a report with 200 pages. Which of the following word processing operations can reduce the number of pages used?

- (1) Change the line spacing of the text.
- (2) Change the text alignment.
- (3) Change the margins of pages.
- (4) Create a table of contents with hyperlinks.

- A. (1) and (3) only
- B. (1) and (4) only
- C. (2) and (3) only
- D. (2) and (4) only

9. Radio frequency identification (RFID) readers are installed in the door of an office. Amy has an ID badge containing a RFID tag with a 2 KB storage capacity. Her personal information occupies 200 bytes. Every time she enters or leaves the office, a record of 40 bytes is created and stored on her badge. How many records can the badge store?

- A. 44
- B. 46
- C. 48
- D. 50

10. A device is sending 8-bit data in a network where the last bit is a parity bit. One of the following received data has an error. Which one is it?

- A. 0010 0010
- B. 1111 0000
- C. 0011 0011
- D. 1010 0111

11. Study the following online registration form:

Username:	<input type="text"/>
Password:	<input type="text"/> (minimum 8 characters)
Re-enter password:	<input type="text"/>

Which of the following is/are involved in the online registration?

- (1) Data verification
 - (2) Data compression
 - (3) Data validation
- A. (1) only
 - B. (2) only
 - C. (1) and (3) only
 - D. (2) and (3) only

An IP address (IPv6) consists of 8 groups of 4-digit hexadecimal numbers separated by colons, as shown in the following example:

2001:08AB:2347:AFF0:1234:CC23:98D2:1A45

How many possible addresses are there in this IP addressing?

- A. 2^{32}
- B. 16^{32}
- C. 32^2
- D. 32^{16}

Which of the following is the least important when creating a self-running presentation?

13.

- A. Template
- B. Slide layout
- C. Insertion of pictures
- D. Index

14.

Susan plans to buy a new computer for video editing. In general, which of the following is the least important factor that she should consider?

- A. Computation power
- B. RAM size
- C. Number of USB ports
- D. Hard disk storage capacity

15.

Which of the following statements about the accumulator in a CPU is correct?

- A. It is used by the Arithmetic and Logic Unit (ALU) for calculation.
- B. It is used by the Control Unit (CU) to store a memory address temporarily.
- C. It stores the memory address of the next instruction to be executed.
- D. It controls the flow of data in a bus.

16.

What is the possible outcome of lowering the clock rate of a CPU in a desktop computer?

- A. Consumes less electricity.
- B. Increases the accuracy of computation.
- C. Enhances the performance of the WiFi connection.
- D. Increases the protection of the computer from hacking.

17.

Peter has an e-ticket for a concert, as shown below:



Which of the following statements about the barcode on the e-ticket is/are correct?

- (1) Information on the barcode may be decoded even if part of the barcode is damaged.
- (2) Only one type of data, such as numeric data, can be encoded at a time.
- (3) The barcode can be scanned successfully in a maximum of three directions.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

18. Which of the following systems depends on network connectivity?

- A. Real-time system
- B. Single-user system
- C. Batch processing system
- D. Distributed processing system

19. Arrange the following in ascending order by data transfer rate.

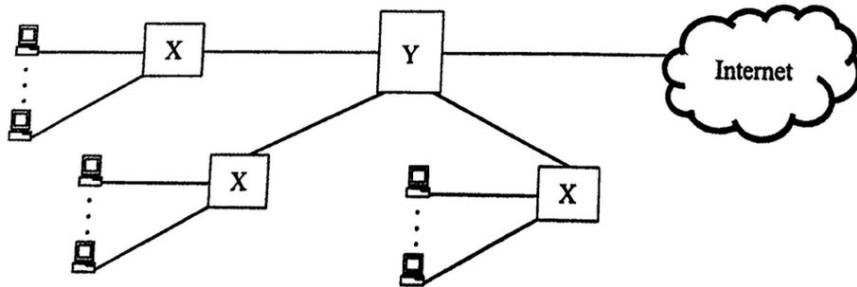
- (1) Solid State Drive (SSD)
- (2) Memory cache
- (3) RAM

- A. (1), (3), (2)
- B. (1), (2), (3)
- C. (3), (2), (1)
- D. (3), (1), (2)

20. Which of the following are the major networking functions of a typical computer operating system?

- (1) Allowing communication between computers
 - (2) Controlling the network bandwidth of a connection between two computers
 - (3) Providing some measure of network security to protect the computers from unauthorised access
- A. (1) and (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)

21. Below is a typical computer network for a school campus:



What are X and Y?

- | | |
|---|---|
| <p>X</p> <ul style="list-style-type: none">A. SwitchB. Access Point (AP)C. RouterD. Switch | <p>Y</p> <ul style="list-style-type: none">Network interface cardNetwork interface cardAccess Point (AP)Router |
|---|---|

Which of the following are the advantages of using a LAN over a WAN?

22.

- (1) Higher data transfer rate
- (2) Larger network coverage
- (3) Lower setup cost

- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

The following two URLs can be used to access the same web site:

23.

'<http://202.8.88.24>' and '<http://www.hkedcity.net>'

Which of the following statements about the two URLs is/are correct?

- (1) The DNS server may translate 'www.hkedcity.net' to '202.8.88.24'.
- (2) A URL must include HTTP.
- (3) The web pages accessed through the IP address are more secure.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

What is/are the advantage(s) of using a network connection on a leased line instead of by broadband?

24.

- (1) The connection is more reliable.
- (2) The cost is lower.
- (3) The bandwidth is guaranteed.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

In HTML, which of the following are the attributes of a table (TABLE)?

25.

- (1) URLs of the contents of cells
- (2) Space between cells
- (3) Media types of the contents of cells
- (4) Background colour

- A. (1) and (3) only
- B. (1) and (4) only
- C. (2) and (3) only
- D. (2) and (4) only

26. Which of the following activities transfers minimal data through the Internet?

- A. Sending an email of 10 KB with a 2 MB audio file to 50 receivers
- B. Uploading and converting an image of 10 MB to JPG format using an online tool
- C. Updating a web page of 10 KB containing a hyperlink to a 2 GB file
- D. Watching a 60-minute video of 500 MB online using streaming technology

27. Which of the following statements about streaming technology is/are correct?

- (1) A music performance can be viewed live.
 - (2) HTTP cannot be used.
 - (3) Illegal distribution of movies can be controlled.
- A. (1) only
 - B. (2) only
 - C. (1) and (3) only
 - D. (2) and (3) only

28. What are the boundary cases for testing in the following segment of an algorithm?

```
Input A
If A > 5
    Then B ← 10
    Else B ← 20
Output A, B
```

- (1) 5
 - (2) 6
 - (3) 10
 - (4) 20
- A. (1) and (2) only
 - B. (3) and (4) only
 - C. (2), (3) and (4) only
 - D. (1), (2), (3) and (4)

29. age is an integer variable and IsStudent is a Boolean variable. Which of the following Boolean expressions produce the same result?

- (1) (age < 25) AND (IsStudent = TRUE)
 - (2) NOT ((age >= 25) OR (IsStudent = FALSE))
 - (3) (age > 25) OR (IsStudent = TRUE)
- A. (1) and (2) only
 - B. (1) and (3) only
 - C. (2) and (3) only
 - D. (1), (2) and (3)

What is the output of the following algorithm?

30.

```
LENGTH ← 6
HEIGHT ← 5
AREA ← LENGTH * HEIGHT
LENGTH ← 4
HEIGHT ← 3
Output AREA
```

- A. 12
- B. 20
- C. 24
- D. 30

31. N is an array and N[1], N[2], N[3] and N[4] store 1, 3, 5 and 7 respectively. What is the output of the following algorithm?

```
K ← 6
i ← 4
while (i > 0 AND N[i-1] > K) do
    N[i] ← N[i-1]
    i ← i - 1
N[i] ← K
Output N[4]
```

- A. 4
- B. 5
- C. 6
- D. 7

32. Study the following algorithm:

```
A ← 1
B ← 1
Repeat
    Output B
    C ← A + B
    A ← B
    B ← C
Until (B > 10)
```

How many times will 'Output B' be executed?

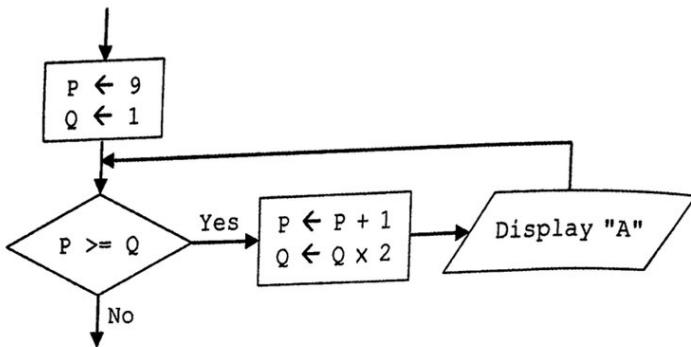
- A. 4
- B. 5
- C. 6
- D. 7

33. *Y* is an array. What is the output of the following algorithm?

```
Y[1] ← 4
For k from 1 to 5 do
    Y[k+1] ← Y[k] + k
Output Y[6]
```

- A. 10
- B. 14
- C. 15
- D. 19

34. Study the following segment of a flowchart:



How many "A" will be displayed?

- A. 0
- B. 2
- C. 4
- D. 5

35. ABC Coffee Shop offers free WiFi for customers. The details are:

ABC Coffee Shop
- A 30-minute session of free WiFi service
- SSID: abc; Password: YW\$1818abc
- Unencrypted connection
- 128 Kbps maximum bandwidth

Customers should not use the WiFi connection for online banking because

- A. the free session is too short.
- B. the SSID is too short and easily guessed.
- C. the data passing through the connection is not encrypted.
- D. the maximum bandwidth is still too low.

36. A photographer posts his photos to a social media web site for the public to look at. Which of the following can be applied to the photo to protect his intellectual property?

- A. Hong Kong Public Key Infrastructure (PKI)
- B. Secure Sockets Layer (SSL)
- C. Digital certificate
- D. Digital watermark

Which of the following will help overcome the digital divide in a city?

37. (1) Implementing a Bring-Your-Own-Device (BYOD) policy in schools to replace desktop computers
(2) Providing more free WiFi hotspots
(3) Providing more than one free email account for each citizen

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

38. Ms Li finds that the file server in her company is infected by ransomware. Some important document files have been encrypted and cannot be opened. What should she do?

- (1) Try to put the encrypted files in another file server and open them.
- (2) Report the incident to the police.
- (3) Pay the ransom to acquire the password.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

Why do people develop open source software?

39. (1) They want to earn more money from selling their software.
(2) They want more people to use their software.
(3) They want to own the copyright of the software.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

40. Which of the following actions will most likely infringe copyright in Hong Kong?

- A. Using peer-to-peer file sharing software to share personal videos
- B. Broadcasting a street view live through a social media web site
- C. Uploading TV programmes to a personal web site and sharing them with friends
- D. Using peer-to-peer file sharing software to search for an audio file

END OF SECTION A

Answer all questions.

1. The Government plans to develop a web-based clinic booking system for citizens to book appointments.

- (a) (i) If the system is a multi-user system, what is the major benefit for citizens?

- (ii) If the system is a real-time system, what is the major benefit for citizens? (1 mark)

- (b) Senior citizens will use this e-government service. What are the major concerns when designing the relevant web pages for senior citizens? Give three examples. (1 mark)

(3 marks)

- (c) The booking system can be accessed through mobile devices using a web browser or via a mobile application.

- (i) Give two technical considerations when designing the mobile application.

(2 marks)

- (ii) Different versions of the mobile application with the same function will be developed at the same time. Why are different versions needed?

(1 mark)

Answers written in the margins will not be marked.

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(iii) Citizens prefer accessing the system using the mobile application rather than a browser. What is the possible reason for this?

_____ (1 mark)

(d) There are 18 districts and each district has more than 10 clinics. A web page in the system allows citizens to book an appointment in any clinic. Draft the layout design of the web page with annotations.

2. An online enrolment system is developed for students to enrol in events in an athletics meet. Students are provided with an account and an initial password.

(a) The system allows students to change their passwords.

(i) The system accepts new passwords with letters and digits. Suggest two additional rules for the system which would strengthen password security.

(2 marks)

(ii) Give an advantage of each of the following security measures for the student accounts.

(1) Forcing users to change their password after the first login

(1 mark)

(2) Showing the previous login date and time when logging into the system

(1 mark)

(iii) In the system, each character of a password is encrypted as a hexadecimal code, ranging from 0000 to FFFF. How many bits are needed to represent a password with 8 characters? Show your calculation.

(2 marks)

A ----- written in the margins will not be marked.

(b) A teacher, Mr Li, plans to teach students shot put skills. He uses a search engine to search for videos about shot put skills. He types some keywords and obtains the following search result:

The screenshot shows a search bar with the text "Shot put". Below the search bar are four navigation links: "All", "Images", "Videos", and "News". The "Videos" link is highlighted. To the right of the links is a magnifying glass icon. Below these elements, the text "33,000,000 results" is displayed. The main content area features a large heading "2017 Eastern District Age Group ...". Underneath the heading, there is a link: "https://www.lcsd.gov.hk/ls/dagc/prop/last/b5/1_009_r.pdf PDF File". Below the link, the text "Shot Put Result: 8.56m 8.49m 8.39m Soft Ball Result: 33.28m" is shown. At the bottom of the search results page, there is a series of numerical values: 22.27, 22.22, 22.25, 22.25, 17.24, 17.24.

- (i) Suggest two ways to improve the search.

(2 marks)

- (ii) Mr Li finds two suitable videos and sends their hyperlinks to his students. On the weekend, a student finds that he cannot watch one of the videos using a computer in a public library. Give two possible reasons for this.

(2 marks)

- (iii) Mr Li plans to search for some photos and post them on his personal web site. Suggest two ways of handling the relevant copyright issues.

(2 marks)

Answers written in the margins will not be marked.

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Ms Wong uses the following spreadsheet to store the list of participating students in an athletics meet:

	A	B	C	D	E
1	Student ID	English name	Chinese name	Year of birth	Grade
2	8101	Wong Siu Fun	王小芬	2003	
3	8102	Chan Cheung Tai	陳長大	2005	
4	8201	Lee Li Li	李莉莉	2006	
5	8202	Wong Ka Yee	黃嘉儀	2003	
	:	:	:	:	:
	:	:	:	:	:
1000	6427	Cheung Yat Man	張一文	2002	
1001	6428	Cheung Yee Man	張二文	2002	
1002	Grade	Number of Students			
1003	A				
1004	B				
1005	C				
1006					

- (a) The grade of a student is defined by the year of birth, as shown below:

Year of birth (Y)	Grade
$Y < 2004$	A
$2004 \leq Y \leq 2005$	B
$2005 < Y$	C

- (i) Ms Wong uses column E to store the grade of each student. She enters a formula in E2 and then copies it to E3:E1001. Complete the formula in E2.

=IF(D2 < _____ , "A", IF(D2 > _____ , "_____ ", "_____ "))
(2 marks)

- (ii) Ms Wong uses B1004:B1006 to store the total number of students in each grade. She enters a formula in B1004 and then copies it to B1005:B1006. Write the formula in B1004.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Based on the spreadsheet, a database table, STUDENT, is created. Part of STUDENT is shown below:

STUDENT					
SID	ENAME	CNAME	YEAROFBIRTH	GRADE	EVENT
8101	Wong Siu Fun	王小芬	2003	A	100M
8102	Chan Cheung Tai	陳長大	2005	B	100M
8102	Chan Cheung Tai	陳長大	2005	B	Shot put
8201	Lee Li Li	李莉莉	2006	C	100M
8202	Wong Ka Yee	黃嘉儀	2003	A	100M

(b) (i) Give an example to illustrate why SID + ENAME cannot be the primary key for STUDENT.

(1 mark)

(ii) Give the primary key for STUDENT.

(1 mark)

(c) Based on the five records given in STUDENT, what is the output after executing the following SQL command?

SELECT GRADE, EVENT, COUNT(*) FROM STUDENT GROUP BY GRADE, EVENT

(2 marks)

(d) Ms Wong has a presentation file about the athletics meet that contains text and images.

(i) Suggest two ways of editing the file to make the presentation attractive.

(2 marks)

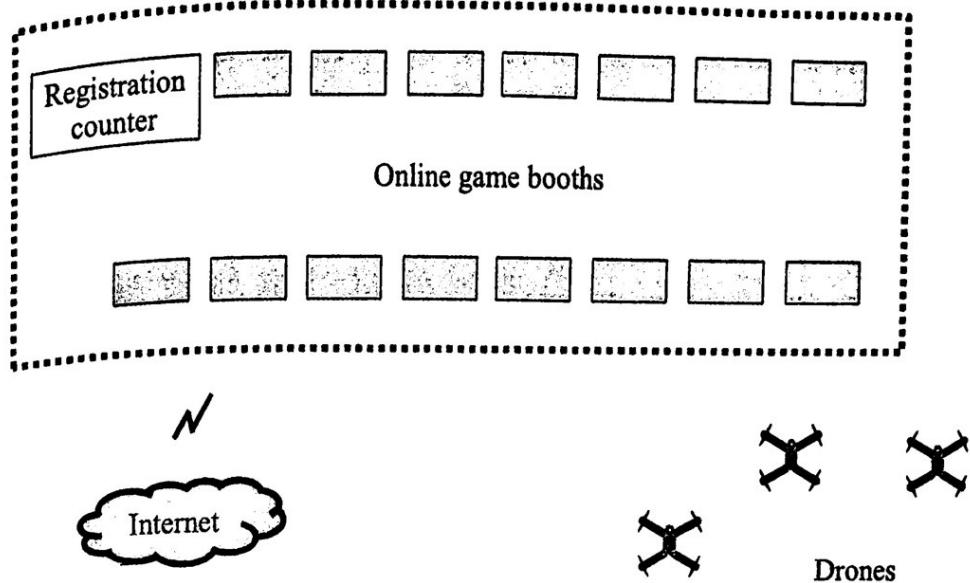
(ii) Ms Wong plans to insert the spreadsheet into this presentation file to show the updated list of participating students. Explain how she can use Object Linking and Embedding (OLE) to complete the task.

(2 marks)

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Answers written in the margins will not be marked.

4. Mr Ng organises an e-sport carnival with drones and online game booths in an indoor stadium, as shown below. There are desktop computers in the game booths for participants to try. He needs to set up Internet connections for the booths.



- (a) (i) Mr Ng decides to set up wired connections instead of wireless connections for the online game booths. Give **two** reasons to support his decision.

(2 marks)

- (ii) Suggest a common wireless connection method for controlling the drones.

(1 mark)

(b) The drones are used to capture images and videos of the carnival.

- (i) Some captured images will be sent to a file server through the Internet. Briefly describe how an image file is transmitted over the Internet with reference to the concepts of data packets and the Internet Protocol (IP).

(2 marks)

- (ii) Mr Ng plans to broadcast the carnival live for the public using streaming technology. Give two technical issues that he should consider.

(2 marks)

- (c) Give three suggestions for setting up the game booths so as to reduce the health hazard to participants arising from the use of desktop computers in the booths.

(3 marks)

- (d) Participants' personal data will be collected at the registration counter and uploaded to cloud storage. Suggest two measures to protect participants' personal data from hacking.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Peter designs a program using an algorithm with an array A, as shown below:

5. $N \leftarrow 6$
For I from 1 to N do
 $A[I] \leftarrow 1 - A[I]$

(a) (i) Suppose that the initial content of A is:

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
0	0	1	1	0	0

What is the content of A after executing the algorithm?

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]

(ii) Suppose that the content of A after executing the algorithm is:

(2 marks)

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
1	0	1	0	1	0

What is the initial content of A?

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]

(1 mark)

Peter modifies the algorithm below:

```
N ← 6
K ← 2
For I from 1 to N do
    If K = 1 then
        A[I] ← 1 - A[I]
    If A[I] = 1 then
        K ← 1
```

(b) (i) Suppose that the initial content of A is:

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
0	0	1	1	0	0

(1) What is the content of A after executing the algorithm once?

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]

(2) What is the content of A after executing the algorithm once again?

(2 marks)

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]

(ii) Suppose that the content of A after executing the algorithm is:

(1 mark)

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
1	0	1	0	1	0

What is the initial content of A?

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
0	1	0			

(iii) Write down the initial content of A such that the content remains unchanged after executing the algorithm.

(2 marks)

A[6]	A[5]	A[4]	A[3]	A[2]	A[1]
0	0	0			

(1 mark)

(c) Peter will execute the program millions of times with $N \geq 64$ on his desktop computer and wants to improve the performance of the program execution significantly.

(i) Increasing the size of RAM does not help. Why not?

(1 mark)

(ii) Suggest a hardware component that should be upgraded.

(1 mark)

END OF PAPER

Database (SQL commands - based on SQL-92 Standard)

Constants	TRUE, FALSE
Operators	+, -, *, /, >, <, =, >=, <=, ◊, %, , ', AND, NOT, OR
SQL	ABSOLUTE (ABS), AVG, INT, MAX, MIN, SUM, COUNT, AT, CHAR_LENGTH (LEN), LOWER, TRIM, SPACE, SUBSTRING (SUBSTR/MID), UPPER, AS, BETWEEN, BY, ASC, DESC, DISTINCT, FROM, GROUP, HAVING, LIKE, NULL, ORDER, SELECT, WHERE

Electronic Spreadsheet

Constants	TRUE, FALSE
Operators	+, -, *, /, <, >, =, ◊, <=, >=
Functions	ABS, INT, RAND, SQRT, ROUND, AND, NOT, OR, CHAR, CONCATENATE (&), ISBLANK, LEFT, LEN, LOWER, MID, PROPER, RIGHT, TEXT, TRIM, UPPER, VALUE, AVERAGE, COUNT, COUNTA, COUNTBLANK, COUNTIF, MAX, MIN, RANK, SUM, SUMIF, FIND, VLOOKUP, IF