SHENZHEN COLLEGE OF INTERNATIONAL EDUCATION
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

MOCK EXAMINATIONS

COMPUTER SCIENCE **9618/13**
Paper 1 Theory Fundamentals **March 2025**
1 hour 30 minutes

You must answer on the question paper.
No additional materials are needed.

Mr Barton ☐ **Ms Hannah** ☐ **Mr Lalin** ☐ **Mr Trigg** ☐

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use an HB pencil for any diagrams, graphs or rough working.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].
- No marks will be awarded for using brand names of software packages or hardware.

For examiners use only

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total
/4	/5	/8	/5	/6	/4	/13	/18	/4	/8	/75

This paper consists of **13** printed pages and **3** blank pages.

[Turn over

BLANK PAGE

1 An e-commerce company uses a central server to store customer data and manage orders. Work-from-home employees use thin-client systems to access the company's resources and order management software remotely.

Complete the table by identifying two characteristics of a thin-client.

Describe how each characteristic will be used in **this** software.

	Thin-Client Characteristic	Description of use in this situation
1	…… …… …… ……	…… …… …… ……
2	…… …… …… ……	…… …… …… ……

[4]

2 Data transmitted on the internet passes through multiple different systems.

(a) Describe the role of routers in the transmission of data through the internet.

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…… [3]

(b) Describe the role of the PSTN (Public Switched Telephone Network) in the transmission of data through the internet.

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…… [2]

3 A computer stores binary data.

(a) Tick (✓) **one** box only to identify the **largest** file size:

- ☐ 1024 kibibytes
- ☐ 1 megabyte
- ☐ 1.5 mebibytes
- ☐ 1500 kilobytes

[1]

(b) Subtract the denary number 50 from 100 using eight-bit registers.

Show your working.

Working ……

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……

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Answer ……..

[3]

(c) Convert the hexadecimal number 2A3 into denary.

Show your working.

Working ……

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Answer ……..

[2]

(d) Convert the Binary Coded Decimal 100001011001 into denary.

Show your working.

Working ……

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Answer ……..

[2]

4 A screenshot is stored as a bitmap image.

(a) The screenshot has a resolution of 1200 pixels wide by 400 pixels high. The bit depth is 4 bytes. Calculate an estimate for the file size of the photograph in megabytes.

Show your working.

Working ……

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……

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Answer …….. megabytes

[2]

(b) The screenshot is compressed before being sent in a chat service using direct messaging.

Give **three** benefits of this screenshot being compressed using lossy compression instead of lossless compression.

1 ……

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2 ……

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3 ……

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[3]

5 Computers use logic gates to facilitate their operation

(a) Describe the operation of each of the following logic gates:

AND ……..

……

OR ……..

……

NAND ……

……

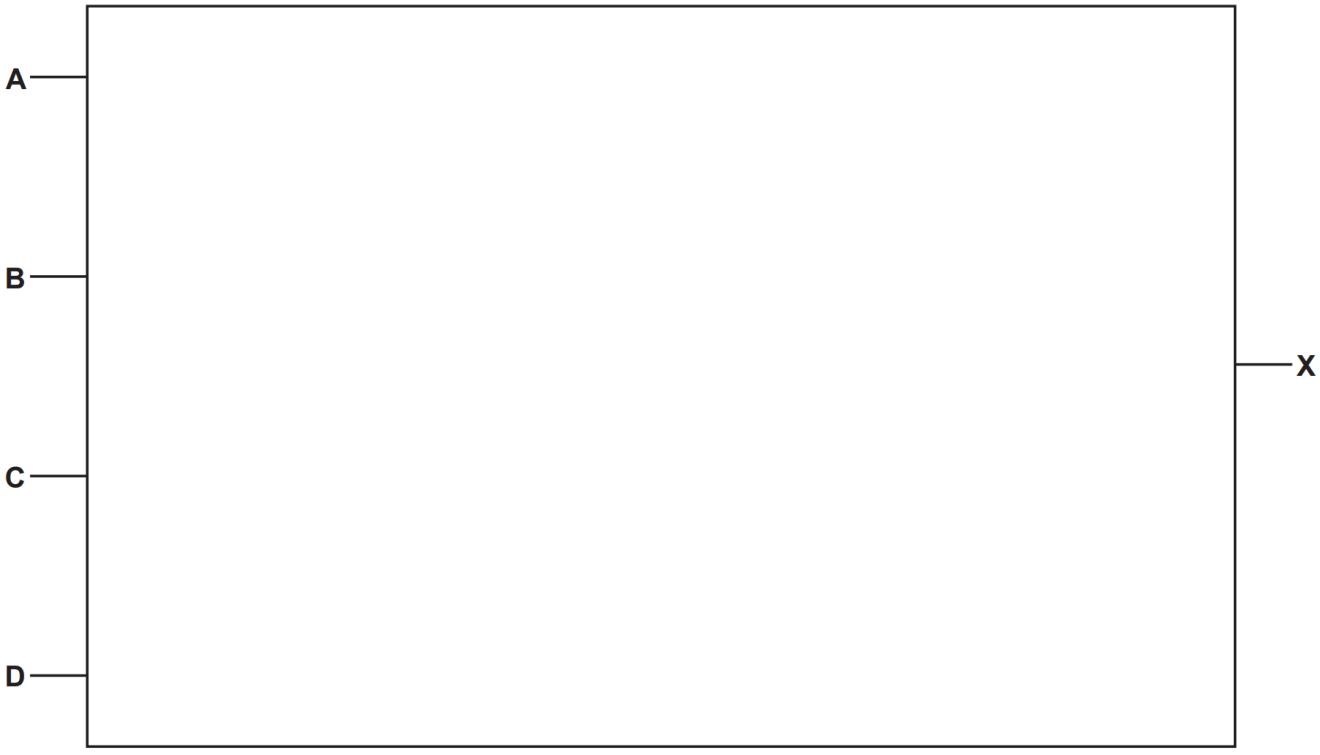
NOR ……..

……

[4]

(b) Draw a logic circuit for the following logic expression:

X = NOT ((**A** OR **B**) AND (**C** OR **D**))



[2]

6 The following database table is not normalised:

EmployeeID	EmployeeName	Department	Projects	ProjectCodes
001	Sara Liang	IT	Website, App	W1, A1
002	Jack Brown	HR	Recruitment	R1
003	Vicky Xie	Marketing	Social media, Ads	SM1, AD1
004	Alan Kirakosian	IT	App	A1

Explain how to modify the table to put it into First Normal Form (1NF).

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..... [4]

7 An e-commerce platform wants to store data about products, customer orders, and order items in a database.

Part of the database design includes the following tables:

PRODUCT(ProductID, ProductName, Category, Price, StockQuantity)

ORDER_ITEM(OrderItemID, OrderID, ProductID, Quantity, TotalPrice)

(a) Sample data for the table ORDER_ITEM is shown:

OrderItemID	OrderID	ProductID	Quantity	TotalPrice
1001-001	O-1001	P001	100	999.00
1001-002	O-1001	P002	150	1198.50
1002-001	O-1002	P001	30	299.70
1003-003	O-1003	P003	90	13499.10

Write a Structured Query Language (SQL) script to define the table ORDER_ITEM.

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..... [3]

(b) Write the SQL script to return the number of "P001" products have been ordered.

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..... [2]

(c) The company would like to expand their database to store data about customer, their orders, and the products in each order. To do this, they will create two new tables, `ORDER` and `CUSTOMER`.

Describe the information in the two new tables **and** explain how these tables would link to the `ORDER_ITEM` and `PRODUCT` tables.

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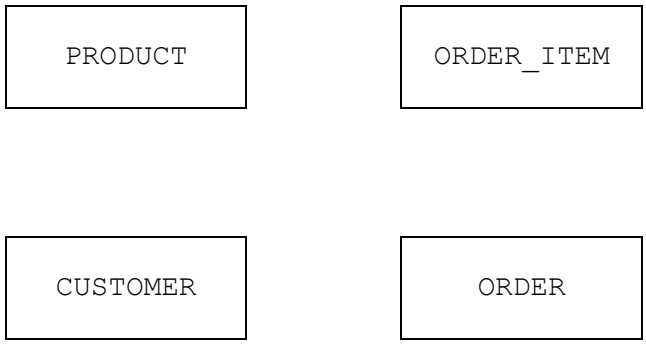
…… [5]

(d) Complete the entity-relationship (E-R) diagram for this relational database.



[3]

8 A technology company is developing a new wearable fitness tracker.

(a) Complete the description of the operation of this new wearable fitness tracker

The _____ is a sensor inside the device used to detect motion to track step count. All versions of the device will also contain sensors to measure heart rate, blood-oxygen, and location. Data is sent to a _____ for analysis. Some upgraded versions of the device also include _____ sensors which allows the user to give voice commands to the device. This device uses sensors to read real-time data and uses that data to vibrate, send audio alerts and text notifications to the user and other third-party systems. This is an example of a _____ system.

[4]

(b) A buffer is used to handle data collected by the fitness tracker before sending it to a smartphone.

Explain how a buffer works in this scenario to manage data transfer.

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…… [3]

(c) The fitness tracker uses Flash Storage to store user data.

Explain two advantages of using Flash Storage for data retention.

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…… [2]

(d) The fitness tracker uses a BIOS that can be updated through the app on a smartphone without the need to remove the chip.

Which ROM technology is used for this BIOS?

…… [1]

(e) The fitness tracker uses SRAM when processing real-time sensor data.

Give one advantage **and** two drawback of using SRAM for this.

Advantage 1 …….

…….....

Drawback 1 ……..

…….....

Drawback 2 ……..

…….....

[3]

(f) The fitness tracker includes a touch screen and a speaker for user interaction and feedback:

(i) The touch screen on the fitness tracker has good visibility, even in sunlight, permits multi-touch, is very durable, but requires bare finger touches to work. Which touch screen technology is this?

…… [1]

(ii) Explain how the fitness tracker converts the digitised file that stores the notification sound into an audible tone the user can hear through the built-in speaker.

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…… [2]

(iii) Give **two** reasons why the data sent to the speaker does not require compression.

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…… [2]

9 A Robot Waiter is used in a new restaurant. The robot navigates through the restaurant using a variety of devices including cameras, accelerometers, distance sensors, etc. to detect and avoid obstacles.

Explain how the robot uses these sensors as part of a control system to avoid obstacles.

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…… [4]

10 The following table shows part of the instruction set for a processor. The processor has two registers: the Accumulator (ACC) and an Index Register (IX).

Instruction		Explanation
Opcode	**Operand**	
LDM	#n	Immediate addressing. Load the number n to ACC
LDD	<address>	Direct addressing. Load the contents of the location at the given address to ACC
LDI	<address>	Indirect addressing. The address to be used is at the given address. Load the contents of this second address to ACC
LDX	<address>	Indexed addressing. Form the address from <address> + the contents of the index register. Copy the contents of this calculated address to ACC
LDR	#n	Immediate addressing. Load the number n to IX
ADD	#n/Bn/&n	Add the number n to the ACC
ADD	<address>	Add the contents of the given address to the ACC
SUB	#n/Bn/&n	Subtract the number n from the ACC
SUB	<address>	Subtract the contents of the given address from the ACC
INC	<register>	Add 1 to the contents of the register (ACC or IX)

<address> can be an absolute or a symbolic address
# denotes a denary number, e.g. #123
B denotes a binary number, e.g. B01001010
& denotes a hexadecimal number, e.g. &4A

(a) The current contents of memory are shown:

Address	Data
20	5
21	10
22	20
23	3
24	40

The current contents of the ACC and IX registers are shown:

ACC	8
IX	1

Complete the table by writing the contents of the ACC after each program has run.

Program number	Code	ACC Content
1	LDD 21 ADD #4	
2	LDI 22 SUB 23	
3	LDR #2 LDX 22 SUB &22	
4	LDR #4 LDX 20 ADD B10010110	

[4]

(b) The processor includes these bit manipulation instructions:

Instruction		Explanation
Opcode	**Operand**	
AND	#n/Bn/&n	Bitwise AND operation of the contents of ACC with the operand
AND	<address>	Bitwise AND operation of the contents of ACC with the contents of <address>
XOR	#n/Bn/&n	Bitwise XOR operation of the contents of ACC with the operand
XOR	<address>	Bitwise XOR operation of the contents of ACC with the contents of <address>
OR	#n/Bn/&n	Bitwise OR operation of the contents of ACC with the operand
OR	<address>	Bitwise OR operation of the contents of ACC with the contents of <address>
LSL	#n	Bits in ACC are shifted logically n places to the left. Zeros are introduced on the right-hand end
LSR	#n	Bits in ACC are shifted logically n places to the right. Zeros are introduced on the left-hand end
<address> can be an absolute or a symbolic address # denotes a denary number, e.g. #123 B denotes a binary number, e.g. B01001010 & denotes a hexadecimal number, e.g. &4A		

Address	Data
25	10101010
26	00001111
27	11001100

The current content of the ACC is shown:

1	1	0	1	0	1	0	0

Complete the table by writing the contents of the ACC after each program has run.

The binary number 11010100 is reloaded into the ACC before each program is run.

Program number	Code	ACC Content
1	AND 25	
2	OR 26	
3	XOR 27	
4	LSR #3	

[4]

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