1 **(a)** State what is meant by **analogue data**.

..... [1]

(b) Draw **one** line from each term to its most appropriate description.

Term	Description
sampling	the number of samples taken per second
sampling rate	taking measurements at regular intervals and storing the values
sampling resolution	the number of bits used to store each sample

[2]

2 **(a)** Describe the impact of increasing the image resolution on the quality of a bitmap graphic.

.....

.....

.....

..... [2]

(b) Calculate the file size of a bitmap image using the following information:

- image resolution of 2048 pixels wide and 1024 pixels high
- bit depth of 16 bits.

Give your answer in kibibytes. Show your working.

Working .....

.....

.....

.....

.....

Answer in kibibytes .....

[2]

3 A company sells online Computer Science courses to students in different countries.

The courses are stored on a public cloud.

(a) (i) Explain why the company uses a public cloud to store these courses.

.....

.....

.....

..... [2]

(ii) Describe **two** disadvantages of storing data on a public cloud compared to storing data on a server in a Local Area Network (LAN).

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

(iii) State how the following security measures can be used to protect computer systems.

Firewall .....

.....

Encryption .....

.....

Passwords .....

.....

[3]

(b) The company uses a database, COURSES, to store data about the courses and their tutors.

Each course starts at different times of the year and may have a different tutor.

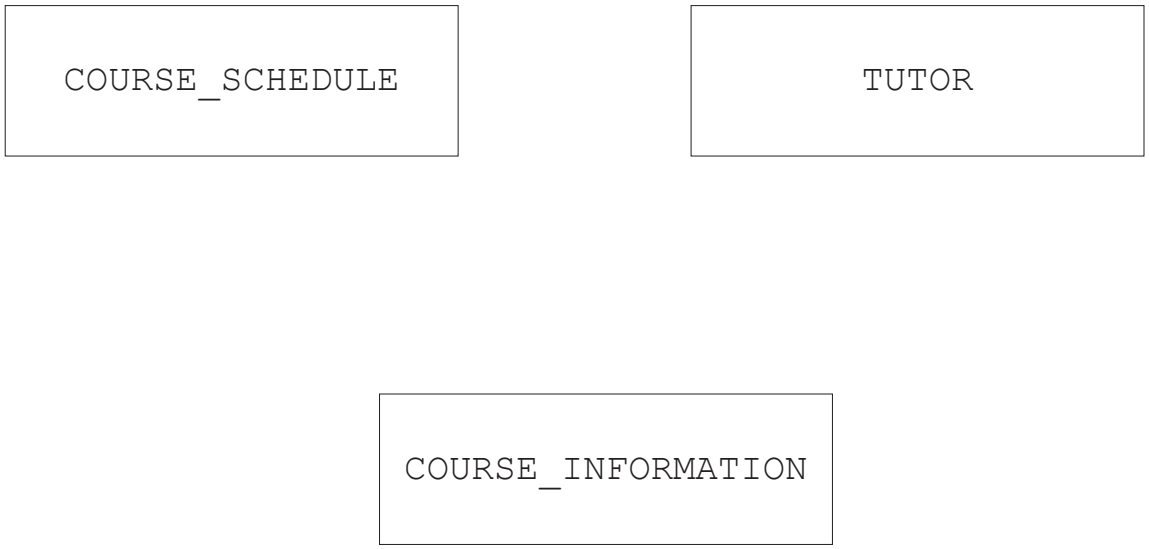
The database has the following structure:

COURSE_INFORMATION(CourseID, Description, Cost)

TUTOR(TutorID, TelephoneNumber, EmailAddress, TutorName)

COURSE_SCHEDULE(CourseID, DateStarted, TutorID)

(i) Complete the entity-relationship (E-R) diagram for the database COURSES.



[1]

(ii) Write the Structured Query Language (SQL) script to return the total number of courses that have started after 9 September 2023.

The value returned must have an appropriate field name.

.....

.....

.....

.....

.....

..... [4]

(c) An example of a tutor ID is NK16C6.

An administrative officer enters the tutor ID into the `TUTOR` table.

Explain how data verification can be used when the tutor ID is entered.

.....

.....

.....

.....

.....

.....

.....

..... [4]

4 **(a)** Complete the truth table for the logic expression:

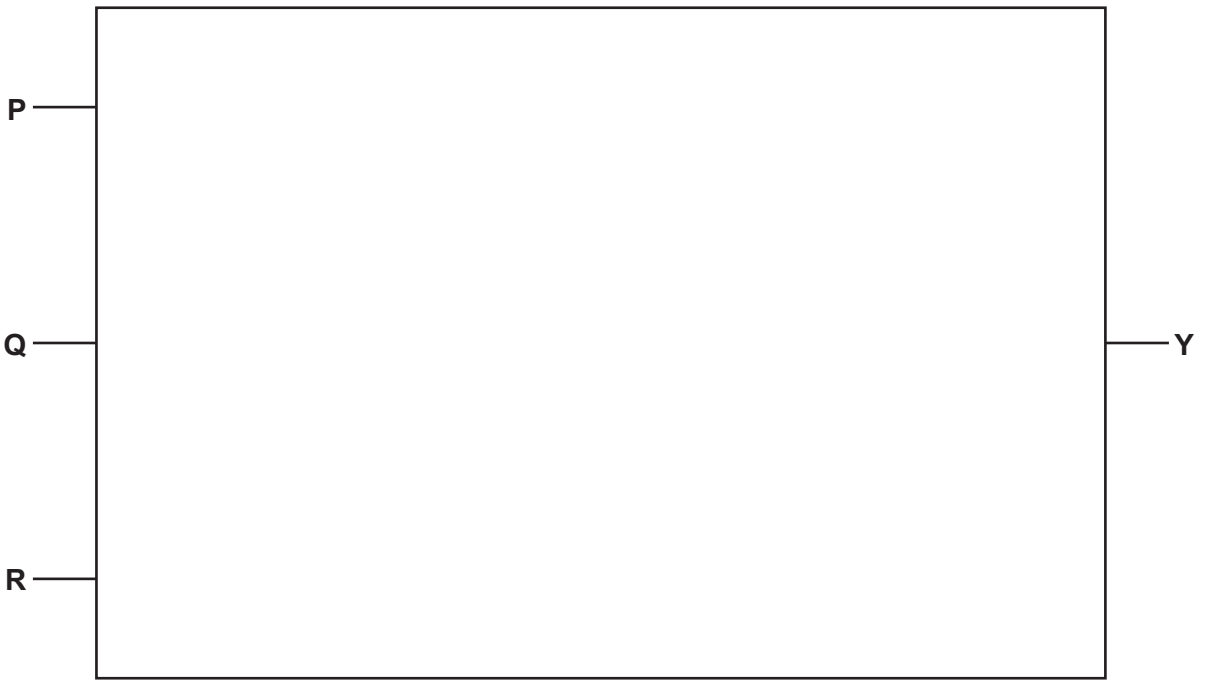
Y = ((**P** AND **Q**) XOR ((NOT **Q**) OR **R**)) AND NOT **P**

P	Q	R	Working space	Y
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[2]

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

Y = ((**P** AND **Q**) XOR ((NOT **Q**) OR **R**)) AND NOT **P**



[2]

5 A programmer uses an Integrated Development Environment (IDE) to develop a program that monitors air quality.

(a) Describe the following features of a typical IDE.

Context-sensitive prompts .....

.....

.....

.....

Single stepping .....

.....

.....

.....

.....

[4]

(b) The program is distributed by downloading the source code and its library files from a web server.

(i) Explain the reasons for compressing the files.

.....

.....

.....

..... [2]

(ii) The program files are stored on a new hard disk after they have been downloaded.

Describe the reasons why a hard disk formatter is needed for the new hard disk.

.....

.....

.....

.....

.....

..... [3]

6 **(a)** State **two** benefits to a programmer of distributing a program using a shareware licence.

1 .....

.....

2 .....

..... [2]

(b) Explain why it is important for a programmer to join a professional ethical body.

.....

.....

.....

.....

.....

.....

.....

..... [4]

7 A laptop computer has Static RAM (SRAM).

A virtual reality headset and a laser printer are connected to the laptop.

(a) Explain why Static RAM is used in the laptop instead of Dynamic RAM.

.....

.....

.....

..... [2]

(b) Identify **two** reasons for using Electrically Erasable Programmable ROM (EEPROM) in a virtual reality headset.

1 .....

.....

2 .....

.....

[2]

(c) Describe how the laser printer makes use of a buffer.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(d) Identify **one** port that could be used to connect the virtual reality headset to the laptop.

Justify your choice.

Port .....

Justification .....

.....

.....

.....

[3]

8 **(a)** Data verification is one method of protecting the integrity of data.

Describe **one** other method of protecting the integrity of data.

.....

.....

.....

..... [2]

(b) State **one** difference and **one** similarity between pharming and phishing.

Difference .....

.....

Similarity .....

.....

[2]

(c) Explain how the data security risks of malware can be restricted.

.....

.....

.....

.....

.....

..... [3]

9 A computer system is designed using the basic Von Neumann model.

Registers and buses are components in the Von Neumann model.

(a) (i) Identify **three other** components in the Von Neumann model of a computer system.

Do not include registers or buses in your answers.

1 .....

2 .....

3 .....

[3]

(ii) Identify **two** differences between special purpose registers and general purpose registers.

1 .....

.....

2 .....

.....

[2]

(b) The following incomplete table contains steps of the Fetch-Execute (F-E) cycle and their descriptions.

Complete the table by writing the missing steps using register transfer notation **and** the missing descriptions.

Step	Description
.....	The address in PC is incremented.
MDR ← [[MAR]]	....
MAR ← [PC]	....
.....	The contents of MDR are copied into CIR.

[4]

(c) Interrupts can be caused by software programs or hardware devices.

State **one** cause of a software interrupt.

.....

..... [1]

(d) The following statements describe the stages that the CPU performs when an interrupt is detected.

There are **three** missing statements.

Write the letter of the missing statements from the table in the correct place to complete the description.

1 At the end of each Fetch-Execute (F-E) cycle, the processor checks if an interrupt flag is set.

2 .....

3 If the interrupt priority is high enough, the processor saves the current contents of the registers.

4 .....

5 When servicing of the interrupt is complete, the processor restores the registers.

6 .....

Letter	Stage
A	The address of the Interrupt Service (ISR) handling routine is loaded into the Program Counter (PC).
B	Lower priority interrupts are re-enabled.
C	The device causing the interrupt transfers data to the CPU.
D	The processor identifies the source of the interrupt and checks the priority of the interrupt.
E	The ISR is incremented.

[3]