

Surname:		Other names:			
Mock Paper	Centre Number:			Candidate number:	
<h1>Computer Science</h1>					
Paper 1: Principles of Computer Science				Paper Ref:	
Time: 1 hour 40 minutes				1CP1/01	
You are not allowed a calculator			Total Marks:		

Instructions

- Use **black ink** or ball-point pen
- Fill in the boxes at the top of this page with your name, centre number and candidate number
- Answer all questions
- Answer the questions in the spaces provided
 - There may be more space than you need
- You are not allowed to use a calculator

Information

- The total mark for this paper is 80
- The marks for each question are shown in brackets
 - *Use this as a guide as to how much time to spend on each question*

Advice

- Read each question carefully before you start to answer it
- Try to answer every question
- Check your answers if you have time at the end



This mock paper was created for students studying Edexcel GCSE 9-1 Computer Science by P. Dring from Fulford School.

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Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

1) A revision podcast contains information about computer science topics

a. **Podcast 1** is recorded using a sampling frequency of 44KHz with 16 bits per sample with no compression.

i. Construct an expression to calculate how many bits are needed for one second of mono audio

(1)

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ii. The podcast team try recoding **Podcast 2** using 4 bit audio sampled at 8KHz instead.

Describe the difference in file size and sound quality they can expect between the two sound recordings.

(3)

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b. The first six samples in the audio recording for Podcast 2 are shown below:

1101 1000 1111 0001 1110 1001

Convert 1101 1000 1111 0001 1110 1001 to hexadecimal

(3)

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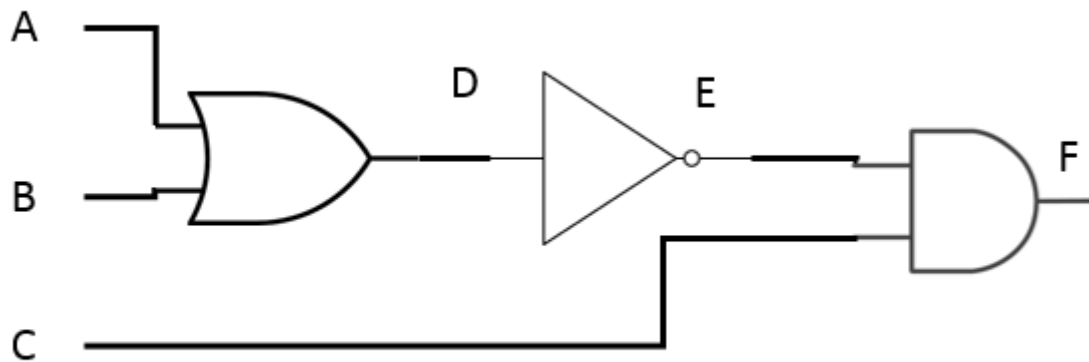
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c. Complete the truth table for the logic diagram below

(6)



A	B	C	D	E	F
0	0	0	0	1	
0	1	0		0	0
1	0	0	1	0	0
1	1	0	1	0	0
0	0	1			
0	1	1	1	0	0
1	0	1	1	0	0
1	1	1	1	0	

2) A delivery drone has an embedded control system.

a. The drone has an altitude sensor which reads the distance the drone is above ground.

i. The distance above ground is 78m.

Convert the denary number 78 to 8-bit binary

(2)

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ii. The drone transmits the altitude to the remote control, which display the value in denary.

Convert the 8-bit binary number 0001 1011 to denary.

(2)

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iii. The drone adds the latest sensor value with the previous value then performs an arithmetic shift in order to halve the result. This will get the average of the two sensor readings.

Latest value: 0001 1011

Previous value: 0001 1100

Sum: 0001 1011 + 0001 1100 = 0011 0111

Perform an arithmetic shift on 0011 0111 to halve its value

(2)

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b. The drone's altitude (in metres) is stored in an 8 bit twos complement number. When testing the drone, it works fine until it reaches a height of 127m. If it rises any higher, the remote control reports that the drone has crashed even though it is still within range and flying normally.

i. How could you store the altitude differently to avoid this problem?

(1)

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ii. Why does the remote control think that the drone has crashed if the drone flies to 128m or higher?

(2)

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iii. The drone also has a sensor which measures the battery life as a percentage from 0 to 100.

State how many bits are needed to represent this percentage.

Give a reason for your answer

(2)

Number of bits

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Reason

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c. A storage device on the drone records the battery levels each second whilst the drone flies.

The data is encoded using an RLE algorithm.

(2)

i. Identify one reason why RLE has been used.

- A To keep data secure
- B To reduce storage space required
- C To prevent data corruption
- D To prevent viruses

ii. The drone can also be operated by WiFi providing that whoever connects to enters the right password.

The password is stored on the device, encrypted using Caesar Cipher algorithm.

Complete the table using a Caesar Cipher algorithm.

(2)

Plain text	Shift	Cipher Text
admin	+3	
password		o z r r v n q c

iii. A security researcher finds an abandoned drone in her garden and is able to read the encrypted cipher text by plugging it directly into her laptop and inspecting the data stored in its memory. Even though she does not know the Caesar shift used to encrypt the password, it doesn't take her long to work out the plaintext password by trying all the possibilities.

Explain the maximum number of attempts she will need to make before guessing the correct Caesar shift

(2)

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3) A company produces black and white digital artwork and sells it for millions of pounds.

a. It decides to invest in a new computer network but arguments break out over how best to connect it. One technician says a ring topology network is better, the other says that a bus topology is better.

i. Explain one reason why a ring topology network might be better than a bus topology network

(2)

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ii. Explain one reason why a bus topology network might be better than a ring topology network.

(2)

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b. One of the black and white digital images is stored using run-length-encoding.

The 5x5 pixel is encoded as: 1B 3W 1B 7W 1B 2W 1B 3W 1B 1W 4B

i. Recreate the image from the RLE encoded data by shading in the black pixels. The first row has been done for you:

(4)

1B 3W 1B

c. The company wants to upload all of the images on to their website.

1 Mbps = 1000^2 bps

1 MB = 1024^2 bytes

The total file size is 18 MB in size.

Their upload speed is 2 Mbps

i. Construct an expression to show how many seconds it will take to upload the files. Show your unit conversions. You do not have to do the calculations.

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ii. State one reason why the actual time to upload the files might be longer than the time you calculated above

(1)

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4) All computers have a CPU, memory and storage

a. RAM and cache are both types of memory

i. Describe one other similarity between cache and RAM

(2)

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ii. Describe one difference between cache and RAM

(2)

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b. Order each of these memory / storage devices from fastest (1) to slowest (5). The fastest has been

Register	
Random Access Memory	
Hard Disk Drive	
Cache	
Backup tape drive	

(3)

c. Describe the effect that doubling the clock speed will have on the performance of a CPU

(2)

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5) A school is concerned that their network is not as secure as it should be

a. Explain how access control can be used to increase security on the school network

(2)

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b. The school decides to use a firewall to block all network traffic except for HTTP and HTTPS protocols

i. Describe one difference between HTTP and HTTPS

(3)

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ii. Describe one protocol that may be blocked by the firewall

(2)

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c. The school uses a commercial analysis tool to identify several vulnerabilities in the school network.

i. State what is meant by 'a vulnerability'

(2)

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- b. The school decides to install software updates and patches automatically

Explain how unpatched software can leave a computer network vulnerable

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- c. The school technicians are arguing over which programming language is most likely to be used to create the software patches.

Use the words below to complete the table to describe different types of programming languages

(4)

Feature	Type of programming language	Example of programming language
Used to write device drivers and real-time systems where speed is essential		
Used to quickly write code that can be made to run on different types of CPU		

High level CPU Assembly Low level Python Compiler

