Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson BTEC Level 3 Certificate, Extended Certificate, Foundation Diploma, Diploma, Extended Diploma

Centre Number

Learner Registration Number

Tuesday 21 January 2020

Morning (Time: 1 hour 45 minutes) | Paper Reference **31769H**

Computing

Unit 2: Fundamentals of Computer Systems

You do not need any other materials.

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 learner registration number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*

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.*
- You may use a calculator.

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.

Turn over ▶

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Pearson

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

1 Cross-stone Manor Park is a busy tourist attraction. There are gardens, a historic building and a museum at the attraction.

Visitors can hire a handheld device that gives them an interactive experience.

(a) The device must communicate with a central server so that the user can access information and services.

The designers of the system have chosen to use a Wi-Fi connection instead of Bluetooth.

Give **three** reasons why the Wi-Fi connection is a more suitable choice than Bluetooth.

(3)

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The device uses a Global Positioning System (GPS) to determine its location. The system will then provide information about points of interest close by.

(b) Users of the system have complained that this feature does not work when they are inside the museum.

Explain **one** possible reason for this.

(2)

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(c) The managers of the park have placed Radio Frequency Identification (RFID) chips in signs around the museum.

The handheld device can scan for the RFID chips. This will allow users to access information relevant to a specific location when GPS does not work.

Explain **one other** way the device could be used to solve this problem.

(3)

The device will use audio outputs.

(d) Describe **one** way the device could make use of audio.

(2)

(e) The device will output the audio to headphones.

Explain **one** reason why the device uses headphones instead of speakers.

(3)

(f) The device uses a menu based interface.

Explain **two** drawbacks of using a menu based interface.

(4)

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(g) The device uses a single-user single task operating system.

Explain why using this type of operating system could improve security.

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(Total for Question 1 = 20 marks)

2 A car park has introduced a computer-controlled barrier and payment system.

Figure 1 is a diagram of the car park showing the placement of key components of the system.

Diagram is not to scale.

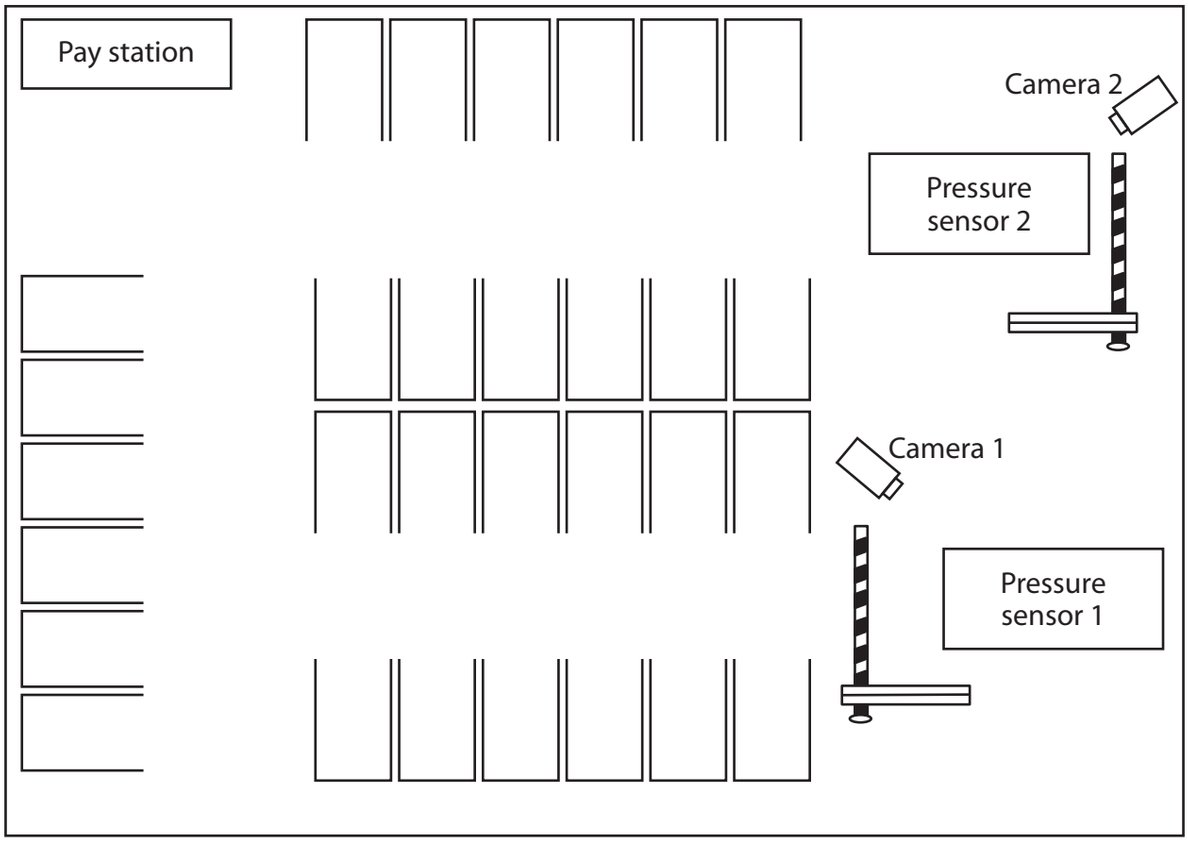

Figure 1

Figure 2 shows some of the specifications of the system.

Parking System Specifications

Pressure sensor 1 detects when a car approaches the barrier to enter.
 	
Camera 1 takes a picture of the car's number plate.
 	
The system uses character recognition to read the number plate and stores this and the time the car enters for later use.
 	
Drivers have to pay at the pay station before going to their car and leaving.
 	
At the pay station:
 	
• drivers enter their car's number plate
 	
• the parking system checks that the number plate the driver has entered matches a stored number plate
 	
• the parking system calculates the cost of parking using the time at which:
 	
  • the car entered the car park
 	
  • the driver entered their number plate in to the pay station
 	
• drivers pay for parking using cash or a credit/debit card
 	
• the parking system records the number plate as 'paid'.
 	
Pressure sensor 2 detects when a car approaches the barrier to leave.
 	
Camera 2 takes a picture of the car's number plate.
 	
The number plate is checked to see if the driver has paid.
 	
If the driver has paid the barrier opens.

Figure 2

(a) The parking system uses pressure sensors and cameras.

Explain **two additional** input devices that could be used to meet the system specifications in **Figure 2**.

(4)

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(b) The number plates will be stored in an array.

Explain why an array is a suitable data structure to use.

(3)

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(c) The pay station has a connection to external networks.

Explain **two** reasons why the pay station would need a connection to external networks.

(4)

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(d) The system uses compression to reduce the file size of the images from the camera.

Explain **one** problem that compressing the images may cause.

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Figure 3 shows the criteria used for calculating parking charges.

Parking Charges

First 30 minutes – **Free**

Longer than 30 minutes:

- £0.50 for 31–60 minutes
- then a rate of £0.70 for each additional 60 minutes.

Figure 3

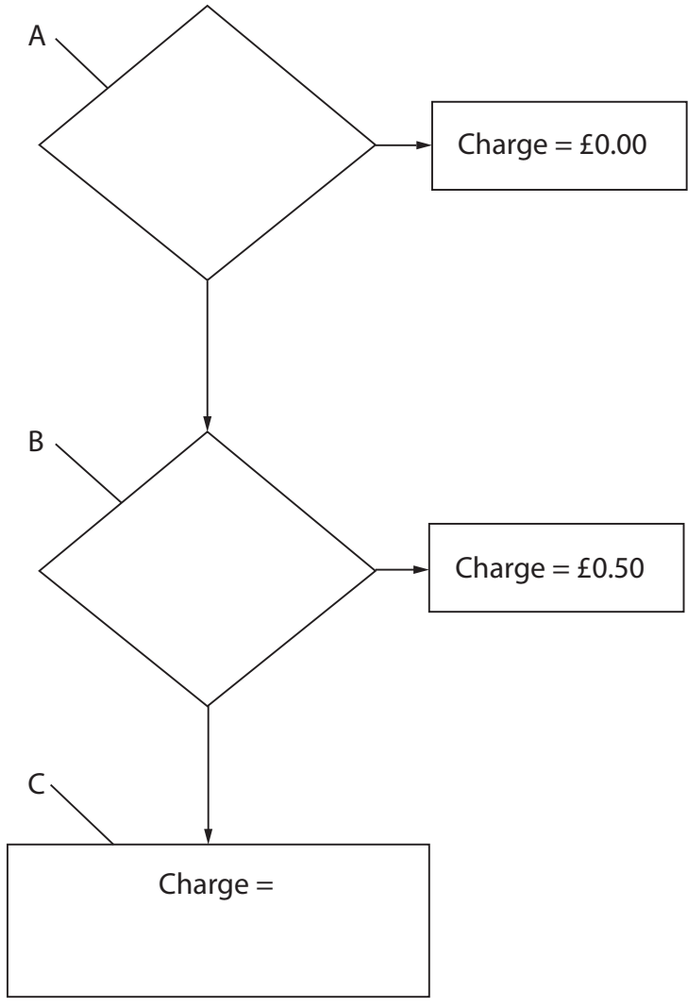
(e) Complete boxes A, B and C for the given flow chart.

The flow chart must show the logic the system will use when calculating the parking charge.

You must include:

- the correct logical check for boxes A and B
- the calculation/formula for box C.

(4)



(f) Draw a flowchart that shows the logic used by the system when a car approaches the barrier to leave the car park.

Assume that if a driver has not paid an error message is output to a screen next to the barrier.

(3)

(Total for Question 2 = 20 marks)

3 Marie is a trainee computer system engineer. She designs and builds computer systems.

(a) All computer systems will use an instruction set.

Describe how an instruction set controls hardware.

(4)

(b) Analyse how the functions of registers impact on the way computer systems work.

You should consider general registers and examples of special registers in your answer.

(6)

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(c) The stored program model revolutionised computing and was a key factor in making computer systems available to all.

Discuss the factors that support this statement.

(8)

(Total for Question 3 = 18 marks)

4 Ramesh owns a small tech development company.

He plans to make a wearable fitness tracker that would link to a smartphone app or computer.

(a) Ramesh must choose appropriate hardware for the fitness tracker.

Discuss the factors Ramesh should consider so that the hardware he chooses gives a good user experience.

Some of the factors you may want to consider are ease of use, performance, availability and accessibility, but you may want to consider other factors. You should use examples to support your discussion.

(10)

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(b) The wearable fitness tracker will collect a range of data that includes:

- types of exercise completed
- duration of exercise
- user's heart rate
- number of steps taken per day
- distance walked/run/cycled.

The app must then allow the user to analyse this data.

Discuss how hardware and software would be used to collect and process data.

(12)

(Total for Question 4 = 22 marks)

TOTAL FOR PAPER = 80 MARKS

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