ICT
0417 Past Papers

Chapter 6
ICT Application

Teacher:Ashraf Al-Massou

7   (a) Explain what is meant by GPS.

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(b) Give **two** examples of the use of GPS.

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7	(a)	Any **three** from:
		– Global Positioning System
		– space-based navigation system
		– typically four satellites must be visible to the receiver
		– calculates the distance from a receiver to the satellite
		– calculates the position of the receiver [3]
	(b)	Any **two** from:
		– used in cars to calculate routes
		– used by walkers to locate position on hills/mountains
		– used by runners to calculate distance run
		– used by farmers for tractor navigation/soil evaluation/livestock control/yield monitoring
		– used in satellite navigation systems for ships
		– used in tracking aircraft [2]

Q9 **(b)** Describe how RFID will be used as he passes through passport control.

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(b) Any **three** from:
- he places his passport against the RFID reader
- he stands in front of a scanner/fingerprint scanner is used
- his facial characteristics/fingerprints are compared with…
- …those stored on the RFID chip   [3]

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13 Doctors often use expert systems to diagnose illnesses of patients.

(a) Describe how an expert system diagnoses illnesses.

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(b) Give **two** other uses of expert systems.

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13 (a) Any **four** from:
   - data is entered using keyboard/touch screen
   - uses interactive interface/asks questions...
   - ...based on previous responses
   - inference engine compares data
   - compares data with that held in the knowledge base...
   - ...using rules base
   - matches are found
   - system suggests probable illnesses   [4]

   (b) Any **two** from:
   - Car fault diagnosis
   - Prospecting
   - Tax
   - Careers
   - Chess games
   - Animal/plant classification/identification   [2]

February/March 2019/12

8 A drone is a remote controlled flying vehicle. A drone is being used to monitor floods in Mumbai.

   (a) Complete the following sentences, using the most appropriate word or words from the list below.

buzzer	joystick	monitor	pressure sensor
ROM	speaker	temperature sensor	video camera

   (i) The drone is microprocessor controlled with input from a

   .... [1]

   (ii) Images of the floods are captured using a

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   (iii) The images sent from the drone are displayed on a

   .... [1]

(b) Name **three** advantages of using a drone to monitor the floods rather than collecting the data manually.

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Question	Answer	Marks
8(a)(i)	joystick	1
8(a)(ii)	video camera	1
8(a)(iii)	monitor	1
8(b)	**Three** from: Data is continuously sent back to the operator/whereas a person would collect it and send it back The drone can work in hazardous conditions Drones get a wider view of the flood Can go where people cannot	3

10 An electric bus system is being considered for New Delhi. Passengers will use smart cards to travel on the bus. They will have to add money to their smart card before they can travel.

(a) Compare and contrast the use of smart cards rather than using cash to pay for a journey.

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The new electric bus system will help to reduce the air pollution in the city. Sensors are used in the system.

(b) Name a sensor that could be used to detect high levels of air pollution.

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(c) The sensor monitors the air pollution. When the air pollution reaches a certain limit, a message is displayed on a street sign in the city to warn pedestrians and road users.

Describe the computer processing involved in this system.

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(d) Data from the sensor needs to be converted from analogue to digital before it is processed.

Explain the need for this conversion.

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Question	Answer	Marks
10(a)	*Similarities* Both used for transactions Both are portable Both allow payment at point of use Max **five** from: *Differences* Faster process/reading using the card Someone needs to check correct payment made with cash/card is automatically checked May not have enough money on the card and may not know this When the money has run out on the card it cannot be used until it is topped up Card details can be used for statistics to plan for use for the bus journey/times A card can be blocked when stolen More security in place if the card gets stolen Sometimes you need the correct cash amount/no change given More likely to have cash in your pocket If you pay by cash you know how much you have paid/no double payment No physical cash with a card so less chance of stealing by employees	6

10(b)	**One** from: Nitrogen oxide (sensor) Light (sensor) Gas (sensor) CO_2 (sensor) pH (sensor)	1

Question	Answer	Marks
10(c)	**Four** from: The microprocessor has a stored value/preset Data from the sensor is compared with the preset value If the reading is higher than the preset value Microprocessor sends signal to the street sign If the reading is lower than the preset value nothing happens / if warning sign is lit; it is switched off	4
10(d)	**Two** from: Sensor only reads analogue data Microprocessor only reads digital data	2

13 Aayush has been involved in an accident and has badly damaged his hand. A surgeon is attempting to replace Aayush's hand with a prosthetic hand.

Explain how the surgeon would use a 3D printer to create the prosthetic hand.

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Question	Answer	Marks
13	**Four** from: (Both) hand is scanned (using CT or MRI scanners or X-ray) A 3D digital copy is made of the injured areas/hand The digital copy is loaded into the software (Software) slices the model into hundreds of layers 3D printer creates the new hand/prosthetic layer by layer Uses plastic/resin The printer binds the layers together The new hand/prosthetic is compared to his other hand Re-printed if necessary The 3D printer prints the final version	4

15 Geographic Information Systems (GIS) use satellites.

Describe, using an example, how GIS can be used.

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Question	Answer	Marks
15	**Four** max from: Allows the user to model and analyse data according to location Allows users to create interactive queries Spatial awareness/see how images fit together in space Edit map data Combines maps, graphics and databases Layers a map with other data Works with GPS **Examples** **One** from, for example: Emergency services can use it to find fire hydrants/other emergency vehicles Protection of animal life in certain areas/flood regions Maps landmarks Teachers use it in Geography/Science/engineering lessons Prospecting oil Maps sites that produce pollution	5

7   Smartwatches can be used in remote regions of the world. These can have an in-built GPS system to help the wearer to locate their position and therefore help with navigation.

(a)   Explain how GPS is used to display their location on the watch.

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(b)   Describe the advantages of using a navigation system with GPS rather than printed maps in this scenario.

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Question		Answer
7(a)	**Four** from: The smart watch picks up radio signals At least three satellites are used Satellites transmit/send radio signals to the Earth Software in the smart watch interpret the signals Triangulation takes place/smart watch is located	4 marks

Question		Answer
7(b)	**Four** from: The wearer does not have to carry maps of the area//more portable More up to date than printed maps Navigation errors are reduced as the satellite gives pinpoint accuracy The system can be used to calculate an accurate route The system may give other information GPS allows user to zoom in	4 marks

13　Many car parks are now fitted with CCTV that can read car number plates.

(a) Explain how number plate recognition systems work.

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(b) Describe **two** problems that could occur when the system reads a number plate .

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Question	Answer
13(a)	**Four** from: An image is taken of the front of the vehicle An algorithm isolates the number plate from the image Colour brightness and contrast are changed to make the number plate easier to read Each character is read using OCR software Each character is decoded using OCR software Number plate and date/time data is stored in a database The number plate is searched in the database Comparison is made with number plates stored in the database Identifies the car
13(b)	**Two** from: Another vehicle/pedestrian could obstruct the view of the camera The number plate may be too dirty to read The number plate may use illegal characters/font It may be a motor cycle with the number plate side on/at the back Characters are misread – e.g. 0 and O, 1 and I, 2 and Z Position of characters/grouping of characters

14 Gabriel is planning a holiday. He is booking his flights through an online booking system.

Discuss the advantages and disadvantages of using online booking systems.

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Advantages

Prevention of double booking
The data is updated immediately
The person booking the seats knows immediately if the seat is taken
The successful booking is known immediately
Bookings can be made 24/7
There are more booking lines than in a manual booking system
The customer needs to add an email address therefore special offers/promotions can be sent from time to time
Easier to see which tickets are available using onscreen plans/colour coding used for booked and different seat prices
Easier to reserve seats than in a manual booking system
E-tickets can be produced therefore less chance of tickets being lost in the post.

Question	Answer
14	**Disadvantages** The customer needs an email address The customer needs a debit/credit card Requires the customer to have a smartphone for e-tickets Customers need an internet connection Expensive to set up/maintain More difficult to cancel a booking Server crash or too many bookings can cause long delays Manual system cannot be used as a backup Easier to make mistakes in the booking

4 Alpine slalom skiing involves a number of skiers racing down a mountain negotiating obstacles. The time it takes each skier to complete the course is measured. The fastest skier is awarded first place. This involves the use of a number of different sensors to monitor variables.

Using words from the list below, complete the following statements.

Humidity	Light	Motion	pH
Pressure	Sunlight	Temperature	Turbidity

(a) This sensor is used to measure how cold it is on the course.

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(b) This sensor is used to stop the clock when a skier crosses the finish line.

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(c) This sensor is used to measure the altitude (height above sea level) at the top of the course.

.... [1]

Question	Answer	Marks
4(a)	Temperature	1
4(b)	Light	1
4(c)	Pressure	1

5   Adinda is a marathon runner. She uses a smartwatch which is a smaller version of her smartphone. She trains by running in areas near her home. She uses a smartwatch with an in-built GPS system to navigate the route she is running.

(a) Describe the disadvantages of using a smartwatch in this way.

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(b) Name **two** other uses of GPS systems.

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(c) Adinda also carries a smartphone strapped to her arm but finds this is difficult to use when running. A smartphone can be used for communication, either for making phone calls or text messaging. Adinda stops part way through her run for a rest and wishes to communicate with her friend using the smartphone.

Describe why text messaging is a better way for Adinda to communicate with her friend rather than making a phone call.

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Question	Answer	Marks
5(a)	**Four** from: The software in the smartwatch needs to be kept up to date Loss of satellite signal can be an issue Problems with battery failure / empty battery Allow example for problems with battery failure e.g. loses the route Problems with electrical storms / weather Problems with mugging Sunlight making the device unreadable Using / programming the smartwatch can slow the runner down	4

Question	Answer	Marks
5(b)	**Two** from: Use in cars / lorries to calculate routes Used in ships / aircraft to locate current position Used in agriculture for tractor navigation Example of Tracking systems	2
5(c)	**Three** from: She may be tired / breathless therefore text messaging is better than trying to talk A text message is sent quicker than the sending of an audio message The text message is sent even though the receiver's phone is turned off / out of range / on the phone A text message is more likely to connect as the data footprint is smaller than a phone call	3

8   Internet banking is changing how we carry out banking transactions.

Discuss the advantages and disadvantages to the customers of the introduction of internet banking.

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Question	Answer	Marks
8	**Six** from: **Advantages** Reduces the cost of travelling to the bank Reduces the time wasted travelling to the bank / waiting in queues The interest rates are usually better using internet banking Easier to shop around for the better bank accounts Disabled people do not have to travel to the bank in order to carry out transactions 24/7 banking People can spend more time doing other activities rather than travelling to the bank Less physical robberies **Disadvantages** Less physical banks which means that people have to travel further to go to the bank Health risks with using the computer Security is an issue as transactions are carried out over the internet The user needs a reliable internet connection More risk of pharming / phishing/fraud Easier to make errors whilst using internet banking e.g. incorrect input If the internet connection drops during a transaction, then there may be issues 1 mark can be awarded for a reasoned conclusion To gain full marks both advantages and disadvantages are required	6

9 Expert systems have many applications.

(a) Name **two** applications that use expert systems.

1...

2...

[2]

(b) Tick **three** components of an expert system.

	Tick (✓)
Interactive user interface	
Spreadsheet	
Motor	
Printer	
Knowledge base	
Search engine	
Actuator	
Rules base	

[3]

Question	Answer	Marks
9(a)	**Two** from: Mineral prospecting Diagnostic systems Chess games Careers Tax	2
9(b)	<table><tr><td></td><td>**Tick**</td></tr><tr><td>Interactive user interface</td><td>✓</td></tr><tr><td>Spreadsheet</td><td></td></tr><tr><td>Motor</td><td></td></tr><tr><td>Printer</td><td></td></tr><tr><td>Knowledge base</td><td>✓</td></tr><tr><td>Search engine</td><td></td></tr><tr><td>Actuator</td><td></td></tr><tr><td>Rules base</td><td>✓</td></tr></table>	3

(e) The doctors in the health centre use an expert system to help them diagnose illnesses.

The symptoms of the patient's illness are typed in by the doctor.

Describe the processing that the system uses so that it can suggest possible illnesses.

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8(e)	**Five** from: System generates questions Inference Engine compares data Compares data with that held in the knowledge base Uses rules base Matches to the symptoms are found System generates a list of possible diagnoses	5

9 A large city centre hotel uses a computer-controlled barrier for entry into its car park. A light sensor is used to detect the presence of a car and prevent the barrier from dropping onto the car.

Describe how a microprocessor uses the data from the sensor to control the car park barrier.

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Question	Answer	Marks
9	**Six** from: Microprocessor is programmed with pre-set values Microprocessor reads data from the sensor Microprocessor compares sensor readings with pre-set values If the readings show there is a car present... ...the microprocessor sends a signal to the actuator Actuator opens/raises the barrier If the readings show no car present the microprocessor sends a signal to the actuator Actuator lowers the barrier	6

14 Several EFTPOS terminals have recently been installed in the ticket booking area of a train station.

Describe the inputs and outputs of such a system when purchasing a ticket.

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Question	Answer	Marks
14	**Six** from: Output: 'Message about the journey' Input: Customer selects journey details Output: Message 'Please enter your card / swipe card' Input: Customer inserts card into chip reader / customer swipes card/customer places (contactless) card on reader Input: Data from the card is read by RFID / magnetic stripe reader / chip reader Output: message 'Please enter your PIN' Input: PIN is entered If incorrect, customer is asked to re-enter PIN Output: Message 'Do not remove your card' Output: Message 'Please remove your card' Output: Ticket is printed Output: Message 'Do you require a receipt?' Input: Yes / No selected Output: If Yes selected, the station EFTPOS terminal produces a receipt Output: verbal instructions on what to do	6

4   A public garden in Canada has a computerised greenhouse to grow rare plants.

(a) Name **three** sensors which would be used in a computerised greenhouse.

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(b) To maintain the environment the sprinkler system sprays water on the plants for four hours each day.

Describe how a microprocessor uses the data from a timer to control the sprinklers in the computerised greenhouse.

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Question	Answer	Mark
4(a)	**Three** from, for example: Temperature sensor Humidity/moisture sensor Light sensor Pressure sensor	3
4(b)	**Six** from: Microprocessor stores start time/time the sprinkler turns on as a preset value Microprocessor stores end time/time the sprinkler turns off as a preset value Microprocessor compares current time with end time/start time/preset value If the current time and the start time are the same, microprocessor turns on the sprinkler If current time is less than end time/preset value, then sprinkler remains on If the time has been reached/exceeded the microprocessor turns off the sprinkler Continual process	6

15 State **two** benefits to a company of using robots on car production lines.

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16 Expert systems are used to diagnose illness in patients.

Discuss the advantages and disadvantages of using an expert system to diagnose illness.

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Advantages
They provide more consistent answers
Do not forget to ask a question
Can reduce the time to find the solution/get results/to obtain a diagnosis
They give a number of different possibilities
Less need for specialists/doctors therefore reduces the cost of finding a solution
Allows the system to be used in parts of the world where experts/medical specialists not available
Use the collective wisdom of more than one expert//it contains more information than one doctor
Can be used online/24/7

Disadvantages
They are machines therefore lack common sense
If the knowledge base contains errors then incorrect decisions can be made
Expensive to set up in the first place/purchase
The need for training for operators
Cost of training for operators
Expensive to maintain

13 Many companies that make microprocessors use robots to carry out the task rather than using humans.

(a) Give **three** advantages of using robots to carry out the task.

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(b) Give **three** disadvantages of using robots to carry out the task.

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Question	Answer	Marks
13(a)	**Three** from: Robots can work in environments where humans would have difficulty Robots can work 24/7 Robots are not paid/cheaper in the long run Productivity is higher Fewer mistakes are made/greater accuracy More consistent Allow humans to do more skilled work/other tasks	3
13(b)	**Three** from: Expensive to maintain/repair Expensive to purchase Replace labour, leads to unemployment Description of de-skilling	3

(d) A computer can be used to model scenarios.

Explain why computer models are used instead of creating the real thing.

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| 8(d) | **Four** from:
Fewer errors in final version of real item as errors would have been resolved in model
Saves money as it saves on resources
Safer to run a computer model rather than risking human life
Different scenarios/what ifs can be carried out which may happen in real life/to experiment
Impossible to try out the real thing due to cost/time
Time scales are reduced, the real thing could take a long time to operate | 4 |

9   A restaurant keeps meals warm in an oven. The meals must be kept at a constant temperature. A temperature sensor is used to check the temperature in the oven.

Describe the use of a microprocessor to control the temperature in the oven.

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Question	Answer	Mark
9	**Four** from: Data from the temperature sensor is sent to the microprocessor The microprocessor has a stored/preset value Data from the temperature sensor is compared with the preset value If the reading is higher than the preset value… …microprocessor sends signal… …to the actuator to turn the oven off If the reading is lower than the preset value signal is sent to the oven to turn/keep it on Continual process	4

10 Many ATMs now allow customers to deposit cash and cheques.

(a) Describe the inputs and processing involved in depositing a cheque using an ATM.

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Question	Answer	Mark
10(a)	Maximum **five** from **each** of: *Inputs:* Insert card/input account number Enter PIN Select deposit Select the language Select cheque Select Account Enter cheque Select 'confirm' amount *Processing:* Checks the cheque is the right way up Scans the cheque Uses OCR to read the font/handwriting Attempts to read the handwriting Reads the details on the cheque using MICR If the cheque cannot be read then stores the cheque for later checking If it can be read then accept cheque Checks if information on the cheque is correct	6

(b) Discuss the benefits and drawbacks, to the customer, of using ATMs to deposit cheques into a bank account.

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Question	Answer	Mark
10(b)	Maximum **five** from **each** of:	6
	Benefits:	
	Human validation is needed to check the amount/signature which improves security	
	May be closer than the nearest bank branch therefore saves time than going to the bank	
	Can deposit cheques 24/7	
	Saves money in travelling to the bank	
	Extra security due to using a card and PIN	
	Less queues in the bank	
	A picture receipt is given of cheques	
	May be more ATMs than banks	
	Drawbacks:	
	If the cheque is torn then it may not be read by the ATM	
	The handwriting on the cheque may be difficult to read therefore delaying the processing	
	Human validation is needed to check the amount/signature this leads to delays in processing	
	People may not be happy in using this method for example for security reasons/prefer human touch	
	Not all ATMs use this method	
	May need a card/PIN to operate	
	Stolen cheques from the customer could be processed more easily	
	ATM may not be working	
	ATM may reject certain types of cheque	
	Confusion for the customer using the ATM as some ATMs may have a different process	
	Cannot get human help if it goes wrong	

(e) The data will be collected from the river using a remote computer connected to sensors to measure the data.

Explain why it is better to use this method rather than collecting the data manually.

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| 6(e) | **Four** from:
Safer than a human measuring the depth of flood water
Continuous measurement/monitoring can be carried out 24/7
More accurate readings can be taken
The readings will be recorded immediately
Won't forget to take readings
Charts can be produced automatically
More frequent readings can be taken | **4** |

14 Ocean City is a port which handles a large number of shipping containers. Containers are automatically transferred between ships, storage areas and lorries at the port. The whole system is operated by robots.

Discuss the benefits and drawbacks of using robots in this type of operation.

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Examples:

Benefits of using robots

Port can operate 24/7

Robots work 24/7/all day

Cost is reduced as there is no need to have a massive work force

Less health and safety issues

The robot can easily identify each container to quickly transfer to the lorries

Less expensive in the long term

Greater precision

Higher productivity

Less likely to drop the containers

Drawbacks of using robots

Initial cost is very high

Maintenance cost is high

Some workers are needed to monitor the operation, therefore specialist work

All containers need to be of the same design and type

If something goes wrong, it may be difficult to easily find the error

5   A geyser is a hot spring in which water occasionally boils, sending a tall column of water and steam into the air. A temperature sensor is used to monitor the temperature near the geyser. The data from the sensor is sent to a microprocessor.

(a) Explain why the data from the sensor has to be changed before it is read by the microprocessor.

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Question	Answer	Marks
5(a)	Microprocessor reads digital data Data needs to be converted so the microprocessor can understand/read the data Sensor reads analogue data	3

(b) Describe **five** advantages of using sensors and microprocessors to monitor the temperature in geysers rather than using manual methods.

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Question	Answer	Marks
5(b)	**Five** from: The microprocessor will not forget to take readings whereas the human might Response time to process the data is faster than manual methods The system is automatic, so workers can be doing other tasks Microprocessor can monitor continuously / 24/7 The readings will be more accurate Readings can be taken more frequently More readings can be taken at once Safer to take the readings as the user does not need to go close to the geyser The sensors can remain in place for longer periods of time The microprocessor can automatically create graphs Data can be analysed / processed faster	5

11 Expert systems are used by doctors.

(a) Describe how an expert system can be used to diagnose illnesses.

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(b) Name **two** other applications of expert systems.

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[2]

Question	Answer	Marks
11(a)	**Five** from: An Interactive user interface appears Questions are asked about the illness Yes and No type answers to the questions Answers lead to other questions The inference engine searches … … the knowledge base … … using the rules base Probabilities / possibilities of diagnoses and treatments are displayed Displays the ways it achieved the solutions / conclusions / explanation system	5
11(b)	**Two** from: (for example) Mineral prospecting Car engine fault diagnosis Chess games Tax queries Careers recommendations	2

17 The number of people who now shop online has increased over the past few years.

Discuss the advantages and disadvantages to a customer of shopping online rather than travelling to a mall to shop.

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Advantages:
No longer need to travel to the store saves cost of travelling to the store saves time in travelling to the store
Saves time shopping as favourite lists can be produced
Saves time shopping around different stores
Can shop world-wide without leaving home
Wider range of shops
Customers can shop 24/7
Customers get more leisure as they save time shopping
Customers can compare the prices of different stores without leaving the home
Shopping can take place (using mobile devices) anywhere there is an internet connection
Goods are delivered to the home; no need to collect them
Can see the physical objects in store and then have the advantages of shopping online
Customers can see the physical object and then select goods to match themselves
Goods bought on line can be picked up in store at a convenient time
No need to walk around the store as the customer can arrive and pick up the goods; saving time

Disadvantages
Makes people lazy/lack of exercise
Over-reliance on computers
Security issues: for example: hacking / stealing credit card details / virus attack / spyware attack / phishing / pharming
Need to buy a computer / mobile system and internet connection
Needs a reliable internet connection
Goods can take time to arrive
There may be delivery costs
Can order items that you don't wish to order / mis-manage the ordering

7 A farmer has purchased a computerised feeding system for her goats. A goat has an RFID tag attached to its ear, which is recognised by the computer. The system uses a passive RFID tag.

(a) Describe how the RFID tag can be activated.

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(b) The system recognises the goat and therefore gives the correct feed to the animal.

Describe how RFID technology will be used to give the correct feed to the animal.

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Question	Answer	Marks
7(a)	**Three** from: The RFID reader sends radio waves / signal to the RFID antenna in the tag Tag sends radio wave / signal back to the reader The radio waves move from the tag's antenna to the microchip / IC ... … a signal is generated and sent back to the RF system The RF wave is detected by the reader which interprets the data.	3
7(b)	**Three** from: The goat passes the RFID reader The RFID reader extracts data from the tag The ID is compared with data stored in the database The feed for the goat is then selected / identified / read from the database	3

9 Automatic car parking systems built into cars are becoming more common. They allow the car to park safely in a parking bay unaided. The car uses proximity sensors fitted to the front and rear of the car to help it park. There are many advantages to using these sensors.

(a) State **three** disadvantages of using proximity sensors in this way.

1 ....

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2 ....

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3 ....

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[3]

(b) Modern-day drivers rely less on paper maps and more on satellite navigation systems (satnav).

Describe the inputs, outputs and processing of a satnav when used by a driver to reach a destination.

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Question	Answer	Marks
9(a)	**Three** from: The sensors can drain power from the car Faulty sensors / poorly calibrated can give incorrect readings and the car could collide with an obstacle If the car's computer malfunctions the sensors will not work People are unsure if it is safe to use the system It can give a false sense of security / over-reliance Needs to be turned off in traffic jams	3
9(b)	**Four** from: Destination is input by driver Exact position of motor vehicle is continually calculated using GPS … … using data transmitted from 3 / 4 satellites The on board computer contains pre-stored road maps The car's position is displayed on the map / route displayed Algorithm calculates the route from current car's position to destination … … makes allowances for traffic jams / roadworks Car system receives regular updates of traffic conditions Outputs the journey time/ETA of journey / voice output Calculates the journey time / ETA of journey time Outputs speed limits / cameras / warning speed limit	4

5   A fish farm has a computer system that constantly monitors the quality of the water in its fish ponds. The system uses sensors to carry out the monitoring.

   (a) Name **two** sensors that could be used to monitor the quality of the water in the fish ponds.

   1 ....

   2 ....

   [2]

   (b) Name the device that is used to convert the data from the sensor into a form that could be read by the computer.

   .... [1]

(c) Describe the role of the computer in monitoring the quality of the water in the fish ponds.

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Question	Answer	Marks
5(a)	**Two** from: pH (sensor) Temperature (sensor) Light (sensor) Oxygen (sensor) Nitrogen (sensor)	2
5(b)	Analogue to digital convertor/ADC	1
5(c)	**Three** from: The computer receives the data from the sensor The computer compares the data with pre-set values/stored data If the data is outside the limit computer sends a signal to an alarm If the data is within the limit no action is taken The data is stored for later analysis The data is sent automatically to a monitoring system	3

8   A large farm uses a robotic system to milk and feed animals. Until recently this would have been carried out by farm workers.

Discuss the advantages and disadvantages of using robotics in automated farms.

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Question	Answer	Marks
8	**Six** from: *Advantages* Robots can work in areas of the farm that could be dangerous/harmful for a farm worker Robots are better at ensuring a continuous supply of feed Robots available to milk and feed 24/7/ continuous Running costs are cheaper in the long run as robots do not need to be paid Higher/more productivity due to cows being milked at times of their choice Quicker to see illness in animals due to system checking a number of factors against stored values, so is more objective. The same measurements are taken on all the animals every time the robot checks them therefore better consistency Better/more frequent checking of the animals Robotic tractors can carry out more tasks in a short time Frees up farmer to do other things *Disadvantages* More expensive to buy Maintenance is more expensive Patterns of illness may be found quicker manually Farm workers become de-skilled therefore if the system breaks down there could be issues completing the work Max **five** marks for only advantages/disadvantages A mark is available for a reasoned conclusion	6

15 Drones are unmanned flying vehicles that are used for commercial and leisure activities. Drones are fitted with cameras to monitor situations.

A river has burst its banks following prolonged heavy rainfall. Explain why drones are used to help monitor the situation.

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Question	Answer	Marks
15	**Four** from: Safer to use drones than human life being risked in flood waters Drones can fly low over the flooded areas checking the extent of the damage, would be more difficult/dangerous for a human Drones can be used in areas that would not be accessible to humans Cheaper than using a helicopter to film the flooding Drones can cover a greater area than a human in the time available They are portable and can be transported from place to place easily Can automatically return to the base station when fuel is running low	4

6   A soccer club uses ICT to help analyse its players' performance in a soccer game. The players use wearable technology with GPS tracking systems. The data collected from the GPS is analysed by a computer which then displays the results on the monitor at pitch side.

   (a) Describe, in detail, how this system could work.

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   (b) The wearable technology includes a number of sensors that continuously monitor the players.

   Name **two** physical variables that could be monitored during the game.

   1 ....

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   2 ....

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                                                                                                                                              [2]

   (c) After the soccer game the data is printed.

   Name a suitable type of printer the soccer club could use and give a reason for your choice.

   Printer ....

   Reason ....

   ....

   ....
                                                                                                                                              [2]

Question	Answer	Marks
6(a)	**Four** from: The position/location of the player is calculated using GPS software Data is transmitted/sent to the pitch side computer every few seconds Algorithm calculates the speed/distance player has moved The data is stored/saved in the computer The coordinates of the player are shown onto the map of the pitch	4
6(b)	**Two** from: Temperature Heart rate/pulse rate Breathing rate	2
6(c)	1 mark for name of <u>suitable</u> printer 1 mark for appropriate reason	2
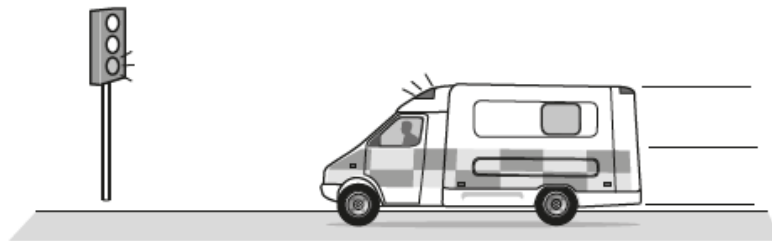
The ambulances used by the health authority are fitted with RFID chips. These are scanned when the ambulance approaches traffic signals. If the ambulance is on an emergency call the lights automatically change to green.

(c) Describe, in detail, what happens when the ambulance approaches the traffic signals prior to the computer instructing the traffic lights to change to green.

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(d) The traffic controller is considering changing to a number plate recognition system on all traffic lights.

State the advantages and disadvantages of using RFID technology rather than number plate recognition in this scenario.

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Question	Answer	Marks
9(c)	**Four** from: The traffic signals have a radio-frequency reader/scanner The reader sends out radio signals to the chip The RFID reader extracts data from the RFID chip The scanning device/reader provides energy/activates so that the chips can broadcast the information in them to the reader The scanning antenna sends out radio-frequency signals in a relatively short range It provides a means of communicating with the RFID chip (in the ambulance) The reader sends data to the computer/microprocessor/actuator The data is compared with data stored in the database	4

| 9(d) | Max **three** from:
Advantages of RFID
Not affected by the weather – must be qualified
All ambulances need to register their number plates so if one arrives from out of the area it could cause problems
Does not need a live connection to a database of number plate numbers
RFID more accurate – less likely to be misread // not all number plates can be read by recognition systems
Line of sight not required

Max **three** from:
Disadvantages of RFID
Signals may affect other electronic equipment in the ambulance
Cost of fitting/maintaining to all ambulances
Difficult to use temporary ambulances // The chip needs to be present in the ambulance for it to work | 4 |

13 Modern supermarkets have automated stock control systems, which use data from the checkouts.

Describe how food items can be ordered by an automated stock control system so they are delivered before the stock in the supermarket runs out.

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.... [4]

Question	Answer	Marks
13	**Four** from: Each item is scanned/bar code is read at the POS terminal Bar code is searched in the database The quantity of products is reduced The stock database is updated When the minimum stock number/level/reorder level is reached Reads re-order quantity Goods flagged as ordered The automated stock system sends a signal to the warehouse computer to order new items The warehouse sends the items to the supermarket Re-order quantity is found in the database Flags removed The stock control system updates the stock levels in the stock control database with the new stock	4

6   A Medical Authority in a large city is planning to centralise its medical booking system. This will allow patients to make all of their doctors' appointments, dental appointments and hospital appointments online.

(a) Discuss the benefits and drawbacks to both the patients and the medical staff of this type of system.

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.... [8]

(b) The Medical Authority creates many different types of documents including letters and memos. Each of them is produced using its corporate house style.

Explain why corporate house styles are required.

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Question	Answer	Marks
6(a)	To be marked as a level of response: Level 3 (7–8 marks): Complete level 2 To gain 7 marks there needs to be a justification of points made To gain 8 marks there must be a reasoned conclusion Level 2 (4–6 marks): Complete level 1 Award a mark for benefits <u>and</u> drawbacks or expansions of each. To gain 6 marks there needs to be benefits and drawbacks to both patients and staff To achieve 4 marks there must be at least one benefit <u>and</u> drawback. Level 1 (1–3 marks): Award a mark for benefits <u>or</u> drawbacks to a maximum of 3 marks Level 0 (0 marks): Response with no valid content	8
	For example: **Benefits** Faster booking system as there is no need to contact individual departments Bookings can be made last minute 24/7 booking The bookings can be easily checked on the internet Easier to cancel/change a booking Faster to cancel/change a booking Easier to book in other medical facilities Multiple bookings can be made for different medical units Email/text reminders More convenient can book from any device/on the move Automatic confirmation of the booking Less time spent on the phone therefore freeing up the system Less staff needed at the medical units therefore cheaper The bookings can be planned easily in advance Reminders can be sent via email/text therefore reducing cost of posting them Repeat appointments can be made automatically therefore saving time Frees up staff to do other things Reduced the patients that do not show up as reminders sent this saves money **Drawbacks** Fear of lack of privacy of the data Fear of lack of security of data If the system goes down the ability to book an appointment is lost Some people prefer to talk to a medical person Medical emergencies may be overlooked Cost of making the system secure Cost of maintaining/setting up the system	

Question	Answer	Marks
6(b)	**Three** from: Ensures consistency across all documents Lets people know that the stationery/documents belong to the same medical authority To reduce the time spent in setting up and formatting documents To reduce cost of setting up and formatting documents To reduce the risk of errors e.g. mis-spellings, logos omitted etc.	3

4   A supermarket has a number of point of sale (POS) terminals. These terminals are linked to the stock database. Goods are automatically ordered when the number in stock reaches or goes below the reorder level.

   (a) Name **two** input devices that would be found at a POS terminal.

   1 ....

   2 ....

   [2]

   (b) Name **two** output devices that would be found at a POS terminal.

   1 ....

   2 ....

   [2]

(c) The manager is checking stock on the shelves and in the stock room. He notices that an item has run out of stock. The database shows that the number in stock is above the reorder level.

   Give **three** reasons why this could have happened.

   1 ....

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   2 ....

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   3 ....

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   [3]

Question	Answer	Marks
4(a)	**Two** from: Keyboard/keypad for entering data Chip reader PIN pad Magnetic stripe reader Bar code scanner Scales/pressure sensor Touch screen Light sensor	2
4(b)	**Two** from: Customer display/touchscreen Printer for receipts Loud speaker	2
4(c)	**Three** from: The items could have been damaged and removed from the shelf The items could have been stolen The items could have been picked up, but they have not yet passed through the till The staff/customers placing the items on the shelves may have put them in the wrong place. The quantity of items on the database may not have been recorded properly Database may not have been updated	3

8   Describe how an expert system can be used to suggest car engine fault diagnoses.

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Question	Answer	Marks
8	Any **five** from: Enter data into/use the interactive user interface Questions are asked about the car engine fault The user answers the questions/Yes or No answers to the questions are typed in Further questions are asked based on the previous answers The inference engine compares data Compares data with that held in the knowledge base… …using the rules base/set of rules… …until it finds a match/matches found System suggests probabilities/possible solutions The explanation system explains how the solutions were arrived at	5

10 Bank cheques are sometimes used to pay bills.

(a) Name **four** pieces of information that the bank's computer may read from the bank cheque.

1 ....

2 ....

3 ....

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[4]

(b) Describe what is involved in the clearing of bank cheques which the bank has collected in the course of the day.

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Question	Answer	Marks
10(a)	Any **four** from: Bank/city/branch code/Acc Number for RBI/clearing centre/IFSC code Cheque number/Unique coding number/UCN/transaction code Account number Amount Account type (current/deposit) Account holder's name/payee/drawer Date written on the cheque	4

Question	Answer	Marks
10(b)	Any **three** from: ***Using standard paper cheques*** The cheques are sent to the clearing bank/centre The amount is read using OCR The city code/bank code/branch code/sort code/cheque number/account number is read using MICR Sort the cheques into bank code order The cheque is scanned using OCR and stored Amount is written onto the cheque using magnetic ink or ***Using digitally image/scanned cheques*** The cheques are sent to the bank clearing system/centre from a smartphone/ATM machine Details of the amount and payee are sent electronically The sort code/account number/unique coding number/UCN is encoded as text The cheque details and encoded MICR are read using OCR and stored ***For both methods*** Check signature correct/cheque correct Date of cheque is checked Amount is checked Payer recognised	3

16 3D printers are being used for producing personalised prescription drugs.

(a) Give **two** advantages of using 3D printers for this purpose.

1 ....

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2 ....

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[2]

(b) Give **two** disadvantages of using 3D printers for this purpose.

1 ....

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2 ....

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[2]

Question	Answer	Marks
16(a)	Any **two** from: Tablets can be customised to individual needs Easier to change the percentages of drug in the tablet Mass produced or small batches therefore reducing waste Created as needed therefore reducing waste Patient gets the drugs quicker	2
16(b)	Any **two** from: Cost of buying the printer is expensive Materials are expensive Can be used for illegal production of drugs There are not many 3D printers created to date to do this	2

9   An automatic washing machine contains a device to read RFID chips sewn into clothing. When an item of clothing is placed in the washing machine it is scanned.

(a) Describe how the data is read from the RFID chip.

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.... [2]

(b) Explain the benefits of using RFID technology in a washing machine.

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Question	Answer	Marks
9(a)	Any **two** from: – The washing machine sends out (interrogation waves) radio signal to read the data from the RFID – They act as a passive transponder Or – The clothing has a battery (attached to the RFID) – The radio signal is given out by the chip read by the receiver... – ...using its antenna	2
9(b)	Any **two** from: – It stops material being incorrectly washed – It stops coloured items of clothing being in the wrong wash – It stops clothing of different material being washed with others – It allows the wash cycle to be set automatically – It will know the amount of water to use so won't waste water	2

10 The city of Venice is in danger of being damaged due to rising sea levels. A new computer controlled flood defence system is being planned. The developers of the system are using a spreadsheet to model the plan.

(a) Give **three** reasons why computer models are used to simulate the flood defence system.

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[3]

(b) The city uses a manual system for detecting flood waters. This relies on people watching for the rising levels of water.

Explain why creating a computerised system is better than using the manual system.

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(c) The developers have used the results from the model to choose a computer controlled flood defence system. It will have a barrier which can open or close.

Describe the role of the microprocessor in such a system.

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Question	Answer	Marks
10(a)	Any **three** from: – Cheaper than building the real thing – Quicker to see results rather than building it – Safer than building the real thing – Easier to change variables in the model/can use what ifs	3
10(b)	Any **four** from: – The sensors are out in the bay therefore there is a faster response to floods – Safer as flood watchers are not put in danger from rising waters – Data collected is more accurate – The data readings can be taken more frequently – Data collection can be continuous – The town's people can be alerted faster of the danger – Predictions can be made from the data easily	4

Question	Answer	Marks
10(c)	Any **five** from: – The microprocessor reads the data from the sensor – The microprocessor has a set of pre-set values stored – The microprocessor compares the readings from the sensors with the pre-set values – If higher the microprocessor sends a signal… – …to the actuator to close the barrier – If lower the microprocessor sends a signal… – …to the actuator to open the barrier	5

16 Robots are being used in the mining industry to dig up minerals from under the surface of the Earth.

(a) Give **three advantages** of using robots rather than humans to do this task.

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[3]

(b) Give **two disadvantages** of using robots rather than humans.

1..

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2..

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[2]

Question	Answer	Marks
16(a)	Any **three** from: – Safer as humans could be injured in rock falls – Easier to replace a robot rather than train a miner – Robots do not require wages hence it is cheaper in the long run – Robots work 24/7 / continuously – Robots can work in hazardous conditions – Robots produce greater productivity	3
16(b)	Any **two** from: – Any changes needed to the mining equipment/rock type requires a reprogramming of the system – Reprogramming takes time – Reprogramming can increase the cost – Setting up the robot in the mine will be dangerous for humans – Expensive to maintain/repair – Initial cost of the robot is expensive	2

1   When a person buys goods in a supermarket they have to pay at the checkout.

    (a) Identify **two** input devices used at the checkout.

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       2...

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                                                    [2]

    (b) Identify **two** output devices used at the checkout.

       1...

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                                                    [2]

Question	Answer	Marks
1(a)	Any **two** from: – Weighing scales – Keyboard/key pad – Bar code scanner/reader – Chip reader/card reader – Magnetic stripe reader – Pin pad – Light sensor (on conveyor belt) – Touch screen	2
1(b)	Any **two** from: – Printer – Screen/monitor – Speaker/buzzer – Warning light/lamp	2

5   The managers of a nuclear power plant need to check the radioactivity levels in a chimney stack which needs to be demolished. They intend to use a robot. This device has sensors to read the radioactivity levels.

(a) Explain why the data from the sensors cannot be read directly by the microprocessor and name the device needed to change the data into a form that the microprocessor can understand.

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(b) The managers have been told they can use this robot for other tasks by replacing the existing sensors with different ones.

Give **three** advantages of using an existing robot device rather than developing a new one.

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Question	Answer	Marks
5(a)	The sensor reads analogue data The microprocessor can only process digital data Analogue to Digital Converter is needed to convert the data	3
5(b)	Any **three** from: – More likely to be reliable as it is known that the device will work – It is cheaper than paying full development costs – It is quicker to get into operation as the device has been built – Lower maintenance costs as faults will be known – Lower costs for training staff	3

7   Driverless automobiles use a number of different methods to drive between two points.

(a)   Name a sensor that could be used on the automobile to detect a person walking in front of it.

.... [1]

(b)   Modern automobiles contain electronic devices designed to help the driver.

Suggest **three** examples of labour-saving or safety devices in a modern automobile that use sensors.

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[3]

(c)   Discuss the advantages and disadvantages of these devices in relation to automobile journeys.

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Question	Answer	Marks
7(a)	proximity sensor	1
7(b)	**Any three from:** – Sat nav/GPS to help the driver travel between two points – Auto-parking systems – Automatic windscreen wipers that operate automatically – Cruise control – Lane drift systems – Automatic braking systems/ABS – Tyre deflation alert – Automatic lights/lights that shine round corners – Frost warning system – Fuel level indicator – Hand-brake alert – Airbag systems – Automatic maintenance alert – Expert diagnostic systems – Auto-gear change systems	3
7(c)	**Advantages** Max **four** from: – The journey becomes a lot safer as the driver uses the devices to help, whilst they focus on driving – If the driver falls asleep then the car remains in control – If the temperature is colder outside then the windscreen clears quickly – The ABS stops the driver sliding on ice – Automatic (full beam) lights stop other drivers getting dazzled – Automatic lights (full beam) shows the road ahead in different conditions – Cost of repair reduced as it tells the driver of problems immediately. – The GPS can guide the driver on shortest/quickest route **Disadvantages** Max **four** from: – The driver relies too heavily on the device and can become over reliant/You are legally responsible for the car – The device may fail and put the driver/pedestrians in danger – Sometimes the device is more of a hindrance than a help e.g. parking sensors in traffic jams – Can increase the price of the car – Very difficult for the driver to repair the car himself – GPS can take the driver a long way out of his way when trying to avoid hold ups – The driver can believe the GPS and drive into the river/narrow road. – Air bags can accidentally trigger is there is a small collision/they have a life span – Excessive number of devices/devices left activated can lead to battery drain Allow one mark can be awarded for a reasoned conclusion.	6

8 Expert systems are used in medical applications.

(a) From the list below, tick **two** components of an expert system.

	tick (✓)
Control unit	
Graphics program	
Inference engine	
RFID	
Rules base	
Search engine	

[2]

(b) Describe **three** benefits of the doctor using an expert system to help diagnose a patient's illness.

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Question	Answer	Marks
8(a)	<table><tr><td></td><td>tick (✓)</td></tr><tr><td>Control unit</td><td></td></tr><tr><td>Graphics program</td><td></td></tr><tr><td>Inference engine</td><td>✓</td></tr><tr><td>RFID</td><td></td></tr><tr><td>Rules base</td><td>✓</td></tr><tr><td>Search engine</td><td></td></tr></table>	2
8(b)	Any **three** from: – An expert system may help the doctor make a more accurate diagnosis – An expert system uses data from many experts therefore it contains more knowledge than a single doctor – Cheaper than regularly re-training the doctor – The expert system's knowledge may be more up to date than the knowledge of a single doctor – Cheaper than employing many specialists – The diagnoses given are more consistent	3

5 People can m

(a) A person
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Describe

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(b) When a debit card is read by computer, data on the card can be used for transactions.

List **four** items of data found on a debit card which can be read by computer.

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[4]

Question	Answer	Marks
5(a)	Any **six** from: – User telephones the bank telephone centre – System asks for the long number on the credit / debit card / sort code and account number / customer ID number – The user taps out on the phone keypad / speaks the number – System asks for certain characters in a password – The user taps out the characters asked for – System rejects the password – The user re-enters the characters – After three attempts the telephone connection drops – System asks other security answers – The user taps it in / speaks the answer – System asks which service you require / options given – Users tap in the number (transfer from one account to another) – System asks number of account transfer from – User taps in account number – System connects with the bank account – System asks for number of account transfer money to – User taps in account number – System asks amount to transfer – User taps in the amount – System asks when the transfer should happen – The user taps in the date – System ask you to confirm it/sends a text message / send email	6

Question	Answer	Marks
5(b)	Any **four** from: – Sort code – PIN – Debit card number – Bank account number – Valid from – Expires end	4

6   Midwest School library has a database system. Students who borrow books present their library cards containing their details. The librarian wishes to improve security by introducing biometric methods.

(a) Name **two** direct input methods the cards could use.

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2...

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[2]

(b) Give **two** examples of biometric input.

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[2]

(c) Name and describe in detail the files the library database system would use.

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Question	Answer	Marks
6(a)	Any **two** from: – Magnetic stripe – RF / RFID – Chip – Bar code	2
6(b)	Any **two** from: – Fingerprint / Thumbprint – Retina scan – Voice – Hand print – Iris scan – Face scan / recognition	2
6(c)	Any **two** matched pairs: – Book file… – …This consists of all data on the books in the library – Borrowers file… – …This contains all the details of the students – Loans file… – …This acts as a link between the book and borrowers file. It contains the details of the date borrowed and return date	4

(d) The fields date_borrowed and date_due_back are contained in the database.

The date_due_back field is calculated from the date_borrowed field. The student can borrow a book for 14 days.

Write a formula for the calculated field **date_due_back**.

6(d)	[date_borrowed]+14	**2**
	1 mark for [date_borrowed] 1 mark for +14	

13 Key-loggers are thought to be security risks but they can be used to monitor and track the use of employees on a computer system.

(a) Describe how a key-logger monitors computer usage.

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.... [2]

(b) A small minority of employees in a company have been using the computers for non-business use, so the company has had to introduce other methods of monitoring their use of ICT.

Apart from key-logging list **three** other ways that employees could be monitored in their use of ICT.

1 ....

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2 ....

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3 ....

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[3]

Question	Answer	Marks
13(a)	Any **two** from: – A key-logger records the key strokes of a person using the computer – Transfers / transmits the data back to the supervisor / manager – The supervisor can then monitor what the employee has been doing / how hard they have been working	2
13(b)	Any **three** from: – Monitoring phone call usage – Monitoring emails – Monitoring the time spent on and websites visited – Monitoring the use of printers / number of copies – Monitoring where employees log in / log out – Monitoring when employees log in / log out – Monitoring failed log ins – Monitor the amount of storage space used – Monitoring where they send data to print	3

14 Recently mobile phones have been used to pay for goods in stores and supermarkets. One method of payment involves holding the phone close to a reader in the store.

Discuss the advantages and disadvantages of this method of payment compared with other methods of credit/debit card transactions.

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Answers may make reference to, for example:

Advantages
Simple to use as all have to do is hold the phone by the reader
No swiping of a card so less damage to the card
Faster method than swiping the card
No PIN
No signature
Stops shoulder surfing
As the credit card does not have to be physically present it cannot be stolen
The credit card number is not used in transactions
…stores do not gain access to names and numbers
No tracking of the data as there is no card
Several cards can be stored and selected
Everyone carries a phone nowadays
Doesn't matter if you forget credit/debit card

Disadvantages
Need a compatible phone
Not available online
Stores need the reader
May be issues with connectivity as a phone is used
Hackers accessing the phone signal
Phones can run out of battery
There is a limit on how much can be paid
Older people may not have phones
More difficult for older people to use

October/November2017/11

7   A city hospital has decided to use emerging technology to automate its packaging and dispensing of medicines to patients. It has decided to use a robotic system which identifies the medicine using bar codes.

   (a) Discuss the advantages and disadvantages to the hospital of using robots within this environment rather than using humans to carry out the task.

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(b) The system currently uses bar codes to read the data on the medicine packets as well as the shelf that the medicine packets are located on. The hospital is considering using embedded RFID chips in the packaging rather than bar codes.

Explain the advantages of using RFID chips in this scenario.

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Question	Answer	Marks
7(a)	Any **five** from: **Advantages** Robots can work in environments where humans would have difficulty i.e. cooler and less light Can work without breaks/non-stop/can work 24/7 Less expensive in the long run Overall wage bill is reduced as there are fewer workers Productivity is higher Less mistakes are made/more accurate Allow humans to do more skilled work than picking the tablets Greater consistency Any **four** from: **Disadvantages** Expensive to maintain (only if Less expensive in the long run has not been given) Expensive to purchase/set up Replace labour, leads to increased redundancy payments If the bar code damaged the human would read the number but robot cannot think for itself A mark can be awarded for a reasoned conclusion Maximum 7 marks.	7

7(b)	Any **six** from: Can be read at a greater distance Don't need to be positioned in line of sight Can be updated easier Read at faster rate More reusable/more robust Larger storage capacity Greater security Cannot misread if RFID grouped together	6

3 A school is holding an athletics competition. The timings of each running event will be measured electronically using sensors at the start and finish. Runners begin a race in starting blocks. When the starting pistol is fired the electronic timing starts. The winner of the race is the first to break the light beam at the end of the race.

(a) Complete the table using the most appropriate words from the list below.

Infra-red sensor **Light sensor** **Moisture sensor** **Motion sensor**

pH sensor **Pressure sensor** **Sound sensor** **Temperature sensor**

	Device
Data from the starting pistol is read by this device	
This device detects that the athlete has left the starting block	
When the light beam is broken the data is read by this device	

[3]

(b) A member of the sports department will use a computer to produce a magazine of the competition. He will include photographs stored in a digital camera as well as printed photographs.

Identify the methods he would use to transfer the photographs to the computer.

Digital camera photograph ....

....

Printed photograph ....

....

[2]

Question	Answer	Marks
3(a)	<table><tr><td></td><td>**Device**</td></tr><tr><td>Data from the starting pistol is read by this device</td><td>Sound sensor</td></tr><tr><td>This device detects that the athlete has left the starting block</td><td>Pressure sensor</td></tr><tr><td>When the light beam is broken the data is read by this device</td><td>Infra-red sensor</td></tr></table>	3
3(b)	*Digital camera photograph* – use a USB connection/insert the memory card/use a memory card reader/download the photograph from the cloud/use bluetooth connection/use wifi connection/connect a cable *Printed photograph* – scan the image/use a scanner/photograph the image using a digital camera	2

(b) Give **four** advantages of using online booking systems for the customer rather than using manual systems.

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[4]

| 11(b) | Any **four** from:
Speeds up the booking process
Customers may not have to travel to the theatre so save money in travelling
Customers may not have to travel to the theatre so save time in travelling/queuing
Postage costs could be reduced
Can make/cancel/change a booking at any time
Can book several shows at same time
Booking can be carried out anywhere | 4 |

14 A robot is used as a computerised postal delivery system. It drives around the corridors of a set of offices picking up and delivering post. If the robot is close to a worker it stops and waits until the worker moves away.

(a) A proximity sensor is used to detect how close to a worker the robot is.

Describe the role of the microprocessor in stopping the robot.

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(b) Robots are being used more and more in offices to carry out menial tasks, like delivering post.

Describe the advantages and disadvantages of using robots in this way.

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....[4]

Question	Answer	Marks
14(a)	**Five** from: The data from the sensor is compared to the pre-set value The pre-set value is set to show the minimum distance of the worker If the values are the same/lower… …the microprocessor sends a signal… …to the actuator to stop the motor/robot The microprocessor starts a timer After a short while the microprocessor restarts the robot The microprocessor stops the timer If the values are different/higher …the microprocessor does nothing/robot keeps moving The process is continuous	5
14(b)	Any **three** advantages: Overall wage bill is reduced as there are fewer workers Productivity is higher/the robot can work all day long therefore is more efficient It has a set path/route to follow which means that staff know when it is due GPS can be used to show where it is in the building Less expensive in the long run/doesn't get paid Less mistakes are made/more accurate Allow humans to do more <u>skilled</u> work Greater consistency Work 24/7/without breaks Any **three** disadvantages: The cost of buying/set up robot is expensive It can only carry out one task Stairs can be a problem Payload size can be an issue Expensive to maintain (only if Less expensive in the long run has not been given) Replace labour, leads to increased redundancy payments <u>Maximum 4 marks.</u>	4

16 The banking industry has rapidly changed over the last few years as modern technology has developed.

Discuss the advantages and disadvantages of using online banking rather than other banking methods to the customer.

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The following are examples only:
Due to laptops/tablets/smart phones banking can take place on the move therefore there is no need to go to a bank
Fewer banks are available to customers
Non IT literate user/ users without equipment will have less access to banking
Need to purchase a computer
Need internet/broadband connection
There is a chance of bank fraud due to devices being used
There is little physical money
Physical money cannot be withdrawn or deposited
Could mismanage account/make a mistake by pressing wrong button
Requires stable internet connection, to ensure is doesn't disconnect midway through a transaction
Available 24/7
Available anywhere your computer can get an internet connection
Saves customers money by not having to travel to the branch
Saves customers time by not having to travel to the bank or stand in queues.

9   Shopping often requires the use of a credit card.

   (a) Give **three** methods of reading the data from the credit card.

   1 ....

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   2 ....

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   3 ....

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   [3]

   (b) Shopping for groceries using the internet has become popular and is replacing more traditional types of grocery shopping.

   Describe the advantages and disadvantages of grocery shopping using the internet rather than other methods.

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Question	Answer	Marks
9(a)	Any **three** from: Magnetic stripe reader Chip reader Contactless reader/RFID reader/NFC reader Using a manual/physical imprint card reader	3

Question	Answer	Marks
9(b)	Any **three** from: **Advantages** Saves time rather than travelling to the shops/No waiting in queues therefore saves time shopping Saves cost of travelling to the shops Orders can be repeated at the touch of a button Schedule in advance/choose time for delivery Can shop worldwide Shop 24/7 Shop from anywhere there is an internet connection Overall wage bill decreases Smaller/fewer shops needed reduces costs More customers from around world Any **three** from: **Disadvantages** Extra costs for delivery/tax With fruit and vegetables customer cannot choose the ripest/best goods Takes time to order Problems if items are forgotten/alternative goods delivered Need a computer/device and stable internet connection Need online payment method Takes time to deliver Need to be in when the goods arrive Loses loyalty Increased delivery drivers (therefore more expensive) To gain full marks candidates need at least one advantage/disadvantage. Maximum 4 marks	4

13 A theatre uses an online booking system to allow customers to book specific seats for its performances.

A customer has loaded the theatre website. Describe the inputs and outputs of such a system before the customer pays for a ticket.

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15 Computers can be used in different applications to control a process, to simply gather data (measurement only) or to mimic a human expert (expert systems).

(a) Tick whether the following applications use **Control**, **Measurement (only)** or **Expert system**.

	Control (✓)	Measurement (only) (✓)	Expert system (✓)
Computerised glasshouse			
Burglar alarm			
Chess games			
Automatic washing machine			
Recording weather conditions			
Monitoring air pollution			

[6]

(b) Measurement systems can use sensors. The computer cannot read the data directly from the sensor.

Explain how a device can be used to enable the computer to read the data from the sensor.

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....[2]

(c) Identify the **four** components of an expert system.

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2 ....

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[4]

Question	Answer	Marks
15(a)	<table><tr><td></td><td>**Control** (✓)</td><td>**Measurement (only)** (✓)</td><td>**Expert systems** (✓)</td></tr><tr><td>Computerised glasshouse</td><td>✓</td><td></td><td></td></tr><tr><td>Burglar alarm</td><td>✓</td><td></td><td></td></tr><tr><td>Chess games</td><td></td><td></td><td>✓</td></tr><tr><td>Automatic washing machines</td><td>✓</td><td></td><td></td></tr><tr><td>Recording weather conditions</td><td></td><td>✓</td><td></td></tr><tr><td>Monitoring air pollution</td><td></td><td>✓</td><td></td></tr></table>	6
15(b)	An analogue to digital convertor is used to convert analogue data to digital data Data from the sensor is input in analogue form Computers only understand digital data	2
15(c)	Knowledge base Inference engine Rules base User interface	4

16 State what is meant by OMR and MICR, giving an example of their use.

OMR ....

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Example ....

....

MICR ....

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Example ....

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[4]

Question	Answer	Marks
16	OMR – Optical mark reader/recognition *Example* – Lottery tickets/multiple choice answers/reads marks on papers MICR – Magnetic ink character reader/recognition *Example* – Cheques/reads the data from the bottom of bank cheques	4

10 In certain countries, the RFID chip in a passport is scanned when the passport is presented at an automated passport control gate.

(a) Give **three** items of information about the passport holder that are stored on the RFID chip.

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2 ....

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3 ....

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[3]

(b) Describe how RFID technology reads the details from the chip.

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....[3]

(c) Explain why RFID technology is used for reading data from passports.

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....[2]

10 (a) Any **three** from:

Name
Passport number
Date of birth
Place of birth
Nationality
Issue date
Expiry date
Facial characteristics/photograph/fingerprint/retina scan
Biometric measurements (face)
Signature
Gender
Place of issue   [3]

(b) Any **three** from:
The chip is presented near a computer with a radio-frequency scanner
The scanning antenna puts out radio-frequency signals in a relatively short range.
It provides a means of communicating with the transponder/the RFID tag
The scanning device provides energy…
…so that the chips can broadcast the information in them…
…for the computer to read.   [3]

(c) Any **two** from:

More secure than a traditional passport as biometric measurement data difficult to forge
Counterfeits can be more easily identified than non-RFID passports
More rapid flow at security check points/quicker than reading it manually   [2]

19 "**Chip and PIN** is the new, more **secure** way to pay with credit or debit cards".

Discuss the accuracy of this statement with regard to developments, since and including the use of magnetic stripe cards at EFTPOS terminals and ATMs.

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Examples of more secure:
Data more difficult to copy
Larger amount of information can be stored
Disabled people find it easier than signing
Reduces disputes at checkouts over validity of signature/Saves time at checkouts
Not affected by magnetic fields
Even when the card is stolen, the thief still needs the PIN, so it is much safer
Magnetic stripe reader had to be in a fixed location.
If the transaction did not take place near a terminal (in a restaurant, for example) the card had to be taken away from the customer to the card machine.
It was easily possible for a dishonest employee to swipe the card surreptitiously through a cheap machine...
...which would take a couple of seconds to record the information on the card and stripe
Even at the terminal, the criminal could bend down in front of the customer and swipe the card on a hidden reader.
Illegal cloning of cards easy, and a common occurrence.
only the magnetic stripe can be copied, and a copied card cannot be used

The introduction of chip and PIN coincided with wireless data communications technology becoming inexpensive and widespread
Wireless PIN pads were introduced that could be brought to the customer and used without the card ever being out of sight
However, this would have been possible, had the technology been available, with magnetic stripe cards
Chip and PIN and wireless together reduce the risk of cloning of cards by brief swiping.

Examples of not always secure because:
Cards can still be cloned
People can be careless when using their PIN.
Credit and debit card fraud has gone down with chip and pin
ATM fraud has gone up.
Hidden cameras sometimes are used to see which keys are pressed for the PIN.
The advent of chip and pin has also generated a rise in phishing

9 Internet banking can be used by bank customers to check their account balance.

    (a) Many ways of logging into such a system involve the use of passwords.

        Describe **three** methods of minimising the possibility of passwords being misused if intercepted.

        1 ....

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        2 ....

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        3 ....

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                                                                                  [3]

(b) Describe **three** benefits to customers of using internet banking.

  1 ....

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  2 ....

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  3 ....

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9   **(a)** **Three** from:

      Encrypting the password
      Ask for memorable information, such as mother's maiden name
      Changing passwords very regularly
      Use TANs
      Only being asked for or providing a limited number of characters from the password
      Twin factor authentication   [3]

    (b) **Three** from:

      Save travelling expenses
      Saves time travelling/queuing
      Elderly/disabled people don't have to travel
      No embarrassment having to ask for loans face to face
      Can bank when banks are closed
      Use it anywhere there's an internet connection   [3]

9 A customer wishes to check the balance of their bank account and inserts their card into the ATM.

(a) Describe the computer processing which takes place at the ATM.

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(b) Describe the computer processing which takes place at the bank's computer.

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.... [3]

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9 **(a)** **Four** from:

The bank account details are read from the chip
The (ATM) checks to see if the card is valid
The customer is asked which language/currency they require
The customer is asked to type in their PIN
The typed PIN number is compared with that stored in the chip…
…if they are the same the transaction proceeds
…if they are not the same the customer is asked to re-enter PIN
If three failed attempts transaction rejected and card withheld
The customer is asked which service is required
Customer is asked if they want a printed balance/onscreen balance
If yes, signal sent to print balance/message sent to screen giving balance
The customer is asked if further services are required   [4]

(b) **Three** from:

Checks whether card is stolen/account number exists
Customer account number is searched
Balance field is read/is calculated
Message sent to ATM giving balance   [3]

5 Identify **four** uses of online booking systems.

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[4]

5 **Four** from:

Air flight tickets
Theatre tickets
Holiday booking
Cinema tickets
Rail tickets
Hotel room booking
Restaurant table/seat booking
Football match booking
Concert/performance booking

[4]

11 Users of a weather station launch a weather balloon into the upper atmosphere.

(a) An example of a sensor attached to the weather balloon would be a pressure sensor.

Name **one** other sensor that should be attached to the balloon.

....[1]

(b) The weather station continuously monitors the sensors on the weather balloon.

Describe the monitoring process.

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....[4]

(c) The weather station could attach sensors to an aircraft and monitor the data as the aircraft flies through the upper atmosphere.

Give **three** advantages of using the weather balloon rather than an aircraft.

1 ....

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2 ....

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3 ....

....[3]

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11 (a) **One** from:
Moisture/humidity (sensor)
Temperature (sensor)
Wind Speed (sensor)
Wind direction (sensor)
Light (sensor)   [1]

(b) **Four** from:
Data is read by the sensors.
The data is converted to digital data/using the ADC.
The data is sent to the microprocessor/computer (in the ground base unit)...
...using a satellite link.
...by radio waves.
Graphs/results are <u>automatically</u> produced by computer.
Graphs are plotted against time.
Data is saved in the computer for later use.   [4]

(c) **Three** from:
Cheaper sending up a weather balloon than using an aircraft due to fuel for example.
Fewer errors as the aircraft movement/heat could affect the data from the sensors.
If the air balloon is checking wind speed it is floating/constant speed therefore more accurate.
Safer, in the event of severe/extreme weather conditions due to the weather balloon not being manned.
The weather balloon will allow weather to be monitored in a fixed location.   [3]

12   Many supermarkets are now using online shopping as well as setting up stores in a mall.

Discuss the advantages and disadvantages to the store of customers using internet shopping.

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....[8]

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12   **Eight** from:
Advantages:
An online shop costs less to set up and run.
Reduced overheads in an online shop
Reduced cost on wages as less shop staff needed
Customers can be better targeted…
…for example: It's also much cheaper, for example, to send a marketing message by email to 1000 customers than it is to send 1000 newsletters by post.
A local business can become nationwide or even international.
An online shop can be updated instantly and as often as you like…
…for example, to promote a 'deal of the day' on your front page, without the need for expensive printed display material.
Can target products and services at specific groups based on buying data.
Business can be promoted through search engines.

Disadvantages:
In order for an online shop to work it needs constant development.
Shops need to understand tax and import/export issues if they become international.
Need to re-train staff to use the online system
The cost of setting up/maintain a website
Costly to re-train
Drop in customer loyalty therefore fewer customers
Need to pay more delivery drivers
Need to buy more delivery vehicles to deliver goods to customers

A mark can be awarded for a reasoned conclusion.
If one side of the argument, i.e. all benefits/drawbacks then 4 marks max.
If both sides have been addressed but without expansions/comparisons then 6 marks max.   [8]

13 Describe the inputs and processing involved in booking tickets online for a music event.

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....[4]

13 **Four** from:
Uses transaction/online processing for booking seats/tickets
The customer enters the number of seats/tickets they want.
The customer selects the performance they want.
The customer selects the time of the performance they want.
The customer selects the date of the performance they want.
Computer searches database to check for availability of seat.
Customer selects seat/ticket.
Customer confirms seat/ticket.
Seat marked as unavailable
Customer enters contact details.
Customer enters payment details.
Seat/ticket booked in customer's name
booking reference is generated.
bar code/QR code/e-ticket generated
transaction completed   [4]

10 Members of a US Conservation Unit recently discovered a species of frog new to New York. They identified the frog using an expert system called ARK.

(a) Describe how an expert system can be used to help identify a newly discovered type of animal.

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....[4]

(b) Identify two other applications which make use of expert systems.

1 ....

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2 ....

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[2]

10 (a) **Four** from:

Enter data into/use the interactive user interface
Questions are asked by the system
The user answers the questions
With yes or no answers
Further questions are asked based on the previous answers
The inference engine compares data
Compares data with that held in the knowledge base…
…using the rules base/set of rules
System produces probabilities/possible types of animal   [4]

(b) **Two** from:

Oil prospecting/rock classification
Medical diagnosis
Car engine fault diagnosis
Chess
Tax systems   [2]

12 A householder has installed a computer controlled burglar alarm.

Describe the processing involved in a computer controlled burglar alarm.

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12 Five from:

Computer checks the input from the user is authentic.
Computer is programmed with pre-set values.
Computer reads data from the sensors.
If the light sensor is activated…
If the contact switch is activated…
If pressure greater than pre-set value…
If sound greater than pre-set value…
If temperature greater than pre-set value…
If the movement sensor is activated…
Computer sends signal to sound the alarm.
Computer sends signal automatically to the police station/alarm company/security company.
Computer sends signal the flashing lights/house lights.
Computer sends message/text/calls automatically to the owner.   [5]

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13 Name **three** components of an expert system.

1 ....

2 ....

3 ....
                                                                                        [3]

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13 Three from:

Knowledge base
Rules base
Inference engine
Interactive user interface   [3]

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14 Car production lines use robots to manufacture the vehicles. The robots have devices attached to their arms to help in the manufacturing process.

(a) For each of the named devices, describe their use on a car production line.

Video camera ....

....[1]

Light sensor ....

....[1]

Pressure sensor ....

....[1]

(b) Give **three** advantages to the company of using robots rather than humans to manufacture cars.

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....[3]

(c) Give **three** disadvantages to the company of using robots rather than humans to manufacture cars.

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....[3]

(d) Cars have to be designed before they can be manufactured. 3D printers can be used to produce models of a car.

Describe the process involved in producing the models.

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....[3]

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14 (a) **For example**
Video camera to inspect the finished product [1]
Light sensors used to detect position of the car [1]
Pressure sensor to make sure the car part is gripped correctly [1]

(b) **Three** from:

Running costs are cheaper than paying humans a wage.
Robots can operate continuously.
Cars are built to a more consistent standard.
Robots are more accurate.
Can be used in hazardous conditions.
Greater productivity [3]

(c) **Three** from:

If a change is made in the manufacturing process the robot needs to be re-programmed.
If a robot makes a mistake it will continue to make the same mistake.
Expensive to set up/maintain
Robots are not capable of performing tasks autonomously without guidance from humans/they cannot think for themselves.
If they break down then they are difficult/impossible to repair.
If the robot breaks down the whole process stops.
The abilities of robots are suitable only for simple activities in which no major difficulties are met. [3]

(d) **Three** from:

3D digital copy is made and put in the software.
Software slices the model into hundreds of layers.
Printer creates the model layer by layer.
Binds them together [3]

17 A new toll road that drivers pay to use has just opened. The company that owns the road uses Electronic Number Plate Recognition Systems to collect payments from drivers automatically.

Describe how an Electronic Number Plate Recognition System works.

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....[4]

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17 **Four** from:

the system has cameras/CCTV
The images and the text from the number plate are captured by the camera
Infrared lighting is used so it can be used in all weathers/at night
The system uses optical character recognition
The licence/number plate is checked against its database to find the car owner's details   [4]

6   Describe how a microprocessor uses the data from input devices to control an automatic cooker.

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....[6]

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6   Six from

Microprocessor stores required temperature as preset value
Microprocessor stores cooking time/start time as preset value
End times as preset values
Microprocessor subtracts cooking time from end time
Microprocessor compares the result with current time
If the current time and the start/calculated time are the same microprocessor switches on heater
Microprocessor compares temperature from sensor to pre-set temperature
If temperature is lower than preset value microprocessor sends a signal to actuators…
…to turn heater on
If higher than preset value microprocessor sends a signal to actuators…
…to turn heater off
Microprocessor compares current time with end time/start time preset value
If current time is less than end time preset value then cycle continues else…
…microprocessor sounds buzzer/beeper   [6]

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8   (a) Identify **five different** items of data that are input at an ATM when cash is withdrawn by a
          customer or read from the card.

1 ....

2 ....

3 ....

4 ....

5 ....
                                                                                          [5]

(b) Discuss the advantages and disadvantages of the use of a local ATM to withdraw cash rather
     than travelling to a bank.

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....[6]

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8   (a) **Five** from:

      Account number
      Sort code
      Expiry date
      Amount to withdraw
      PIN
      Card limit
      Choice of language
      Receipt required (Y/N)   [5]

(b) **Six** from:

      No embarrassment of not having sufficient funds
      Less time spent queuing
      Can get money any time of day or night
      Own bank may be further to travel to than nearest ATM
      Can use most ATMs/does not have to be own bank
      Have choice of languages so is easier to understand/be understood

      When getting cash late at night may be susceptible to mugging
      Machine may be out of order/run out of cash
      Can only be given denominations in the machine
      Limit to the amount that can be withdrawn

      Must have at least one advantage and one disadvantage to gain full marks

      One mark can be awarded for a reasoned conclusion   [6]

14   The doctors at the Mumbai Clinic have commissioned a knowledge engineer to create an expert system to help them with their diagnoses of patient illnesses.

(a)   Describe how such a system would be created.

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....[5]

(b)   Give **two** other applications apart from diagnostic systems which make use of expert systems.

1 ....

2 ....

[2]

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14   (a)   **Five** from:

Data is gathered/collected from experts
Knowledge base is designed/created
A structure to relate each item in the database/knowledge base is created
An interrogation technique to access the data is created
A user interface/method of displaying the results/method of inputting data/input screen/output screen is designed/created
The inference engine is designed/created
The rules base is designed/created
The system is tested   [5]

(b)   **Two** from:

Prospecting
Tax
Careers
Chess games
Animal/plant classification/identification   [2]

7 A home is fitted with a microprocessor-controlled burglar alarm system. It is not connected to a police station.

(a) Tick **three** sensors which would be used in such a system.

	✓
Pressure sensor	
Oxygen level sensor	
Wind speed sensor	
Sound sensor	
Body sensor	
Moisture sensor	
Infra-red sensor	
Touch sensor	

[3]

7   (a)

Pressure sensor	✓
Oxygen level sensor	
Wind speed sensor	
Sound sensor	✓
Body sensor	
Moisture sensor	
Infra-red sensor	✓
Touch sensor	

[1]

[1]

[1]

(b) Describe how a microprocessor-controlled burglar
sensors you identified in part **(a)**.

....
....
....
....
....
....
....
....
....
....
.... [5]

(b) **Five** from:

Microprocessor checks input from the user is authentic
Microprocessor continually monitors sensors.

If infra-red sensor reading changes
If pressure greater than pre-set value...
If sound greater than pre-set value...
Microprocessor sends signal to sound alarm
Microprocessor sends signal to flashing light/house lights.
Microprocessor automatically sends message/calls/texts owner   [5]

9

(d) Give **two** reasons, apart from cost, why computer models are often used instead of the real thing.

1. ....

....

2. ....

.... [2]

(d) **Two** from:

Less dangerous to use a model
Real thing may represent too large a time scale/ it may take a long time to obtain results from
the real thing - genetics etc. Too large a time scale required
Real thing may be wasteful of materials
Real thing may be on too vast a scale
Easier to change data/variables
The real thing may be impossible to access/create
You can test predictions more easily/model can make predictions more accurately
You can ask many whatif questions which would be impractical in real life   [2]

10 Tick **four** drawbacks to car manufacturers of introducing robots on production lines.

	✓
Redundancy payments to previous workers are expensive	
The cars produced are not of a consistent standard	
Robots are unable to think for themselves	
Robots do not go on strike	
Robots are expensive to buy	
Mistakes are never made	
Maintaining robots costs money	
Car workers have to be paid more	

[4]

10

Redundancy payments to former workers are expensive	✓	[1]
The cars produced are not of a consistent standard		
Robots are unable to think for themselves	✓	[1]
Robots do not go on strike		
Robots are expensive to buy	✓	[1]
Mistakes are never made.		
Maintaining robots costs money	✓	[1]
Car workers have to be paid more		

12 Alfonso's family has three computers. He wants each member of his family to be able to access internet shopping.

(a) Identify **three** items of hardware he may need to purchase in order to set up a computer network that will enable this to happen.

1. ....

2. ....

3. .... [3]

(b) Alfonso's teenage daughter uses her computer to create and send work to school.

Describe **three** other ways she could make appropriate use of the internet.

1. ....

....

2. ....

....

3. ....

.... [3]

(c) Describe a strategy that Alfonso's daughter could use to back up her school work.

....

....

....

.... [2]

(d) The bank that Alfonso uses only requires customers to log into their account by inputting a user id and password.

Explain why this is not very secure and discuss other ways the bank could identify the customer securely.

....
....
....
....
....
....
....
....
....
....
.... [6]

12 (a) **three** from:
Network cards
Modem/Router
Hub/switch
Cables
Telephone line [3]

(b) **Three** from:

Using social networks
Booking tickets
Playing educational games
Watching videos/music
Send/receive emails
Create a blog/description of blogging
Researching current affairs/school work
Looking at the news
Reading ebooks/books online [3]

(c) **Two** from:
Copy onto removable storage medium
At regular intervals
Store the medium away from the computer
Make incremental backups [2]

(d) **Two** from:
User id can sometimes be easily guessed
Passwords can be hacked with key logging software
Passwords can be hacked by using random password generators

Four from:
Question is asked such as mother's maiden name/customer's birthplace/date of birth
Question selected can be difficult to answer by hacker.
Answers can be intercepted by hacker
Using a chip and pin reader with bank card to generate a one off transaction code which user
enters into online banking
Bank issues a one off transaction code to the user's phone which user enters into online
banking
Even if hacker intercepts code is no use to him/her as can only be used once
Inconvenient as have to keep reader and card with you if you want to bank remotely
Using fingerprint scanner to capture digital image of fingerprint
Each fingerprint is virtually unique/ Each retina is unique/ Each iris is virtually unique
Fingerprint scanners can be inaccurate
Fingerprints can alter when people do sustained heavy manual work
Civil liberty issues
Using a retina scanner to detect retina pattern
Cataracts/astigmatism can affect accuracy of reading
Equipment cost is high
Using a digital camera to record image of the iris
High quality images of an iris can be used to 'fool' the system
Biometrics are nearly impossible to forge [6]

14 A lending library has introduced an e-book borrowing facility. Borrowers will be able to download a book to their tablet computer or e-book reader. It will automatically remove itself from the device after the loan period has expired.

Discuss the advantages and disadvantages of such a system to the library and the borrower.

....

....

....

....

....

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....

....

....

....

.... [6]

---

14 **Six** from:
Borrower:
Advantages:
Saves cost of travelling to the library
Saves time of travelling to library
More likely to be able to borrow a particular book/library has more copies
Will not be fined for going over borrowing period
Disadvantages:
Might not have finished reading book when it disappears
Have the expense of buying the correct hardware

Library:
Advantages:
Saves cost of salaries as some staff have been made redundant
Librarians will have more time to spend on other duties
Don't have to worry about books not being returned
Disadvantages:
Will lose income from not collecting fines   [6]

7   A microprocessor controlled washing machine is fitted with a number of sensors.

(a) Tick **three** sensors which would be used in such a system.

	✓
Pressure sensor	
Height sensor	
Wind speed sensor	
Sound sensor	
Temperature sensor	
Moisture sensor	
Cold sensor	
Detergent sensor	

[3]

(b) Describe the actions taken by a microprocessor during a wash cycle, based on the readings from those sensors identified in part (a).

....
....
....
....
....
....
....
....
....[5]

7   (a)

Pressure sensor	✓	[1]
Height sensor		
Wind speed sensor		
Sound sensor		
Temperature sensor	✓	[1]
Moisture sensor	✓	[1]
Cold sensor		
Detergent sensor		

(b) **Five** from:

Microprocessor stores pre-set values
Reads data from sensors
Microprocessor compares readings with pre-set value
If temperature is at or above the pre-set value microprocessor sends a signal to turn the heater off
If temperature is below pre-set value microprocessor sends a signal to turn the heater on
At start of cycle, microprocessor sends a signal to open valve to let in water
If water level reached microprocessor sends a signal to switch off valve
If pressure is above preset value microprocessor sends a signal to sound alarm
Microprocessor checks pressure reading and calculates the amount of water to use   [5]

11   Aftab wants to create a network using a PC and two laptop computers he has bought for his family. All have network cards fitted. He has already purchased network protection software. He wishes to use them for online banking.

Name and describe the use of **four** additional items, apart from cables, he would need in order to set up this network.

Item 1 ....

Use ....

....

Item 2 ....

Use ....

....

Item 3 ....

Use ....

....

Item 4 ....

Use ....

....
[8]

11 **Four** matched pairs from:

Modem/Router
To connect the network to the internet

Hub/Switch
To connect the computers to form a network

(Internet) browser
To access the bank's website/to search on different websites/allow access to internet (if not given elsewhere)

ISP (contract)
To access the internet/to provide internet services

Telephone line
To connect the router to the internet [8]

13 Tick **three** drawbacks in terms of costs to banks of introducing online banking.

	✓
Initial purchase of hardware and software is expensive	
Bank workers will have to be paid more	
Extra buildings will be need to be rented	
System maintenance costs may be high	
Cost of lighting and electricity will be higher	
More cashiers will need to be employed	
More security staff will need to be employed	
Redundancy payments will need to be made to cashiers who are now unemployed	

[3]

13

	✓	
Initial purchase of hardware and software is expensive	✓	[1]
Bank workers will have to be paid more		
Extra buildings will be need to be rented		
System maintenance costs may be high	✓	[1]
Cost of lighting and electricity will be higher		
More cashiers will need to be employed		
More security staff will need to be employed		
Redundancy payments will need to be made to cashiers who are now unemployed	✓	[1]

16 An oil prospecting company wants to use an expert system to help it to decide where to drill for oil.

(a) Describe how such a system would work.

....

....

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....

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....

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....

....

....[6]

(b) Give **two** different uses of expert systems for diagnosis.

1 ....

2 ....

[2]

---

16 (a) **Six** from:

Uses interactive interface/interactive interface asks questions about geological profile
Answers to questions are typed in
geological profile is typed in
Further questions are asked based on previous responses
expert system analyses data
inference engine compares data…
…compares data with that held in the knowledge base...
...using rules base
matches are found
Probabilities of oil being present are suggested
Depths of likely deposits are suggested
Predictions of geological strata above the deposits of oil are output   [6]

(b) **Two** from:

Medical diagnosis
Car engine fault diagnosis
Computer fault diagnosis   [2]

9   An office has a microprocessor controlled central heating system.

   (a) Name and describe, in detail, the use of **two** input devices in such a system.

      Name 1 ....

      ....

      Use 1 ....

      ....

      Name 2 ....

      ....

      Use 2 ....

      ....
                                                                                                          [4]

   (b) Describe how the microprocessor would keep the temperature of the office at a constant 19°C.

      ....
      ....
      ....
      ....
      ....
      ....
      ....
      .... [4]

---

9   (a) **Two** matched pairs from:

      Number pad/touch screen/remote control
      For the user to input the <u>required</u> temperature

      Temperature sensor
      To input current temperature of the room/office   [4]

   (b) **Four** from:

      Microprocessor receives temperature from temperature sensor
      Microprocessor stores required temperature/19 as preset value
      Compares temperature from sensor to pre-set temperature/19
      If temperature is lower than preset value/19 microprocessor sends a signal to the actuator…
      …to turn heater on
      If higher than preset value/19 microprocessor sends a signal to turn heater off
      Wait set period of time before looping/process is continuous   [4]

16 A travel company uses an online booking system to book flights for its customers.

   (a) The travel agent will type in the departure date, departure airport and destination airport. The system does not allow invalid airport names.

   Describe the processing and outputs involved in such a system.

   ....

   ....

   ....

   ....

   ....

   ....

   ....

   ....

   ....

   ....

   ....

   .... [6]

(b) Give **three** other organisations which make use of online booking systems.

   1 ....

   2 ....

   3 ....
                                                                                                                   [3]

---

16 **(a)** Six from:

   Computer database is searched for matching departure airport
   Computer database is searched for matching arrival airport
   If flight on correct date found
   Search if seats/tickets available
   If so flags seat as booked
   Reduces number of seats/tickets available by one
   e-ticket details are output
   e-ticket details sent by travel agent to customer   [6]

(b) **Three** from:
   e.g.:
   Theatres
   Cinemas
   Football clubs/stadia
   Holiday booking company   [3]

4 Tick whether the following are uses of modelling, control or measurement.

Use	Modelling ✓	Control ✓	Measurement ✓
The maintaining of growing conditions in a greenhouse			
Simulating car driving			
Monitoring the environment			
Using what ifs			

[4]

4

Use	Modelling ✓	Control ✓	Measurement ✓	
The maintaining of growing conditions in a greenhouse		✓		[1]
Simulating car driving	✓			[1]
Monitoring the environment			✓	[1]
Using what ifs	✓			[1]

7 Students are investigating the behaviour of a colourless liquid in a beaker. As the colourless liquid heats up, it becomes cloudy.

(a) Name **two** sensors that would be connected to a computer in such an experiment.

1 ....

2 ....

[2]

(b) Describe how the student would set up the equipment in the experiment and how the computer would monitor and present the change in readings produced by the experiment.

....
....
....
....
....
....
....
....
....
.... [5]

7 **(a)** Temperature   [1]
Light   [1]

(b) Five from:
  – Light source placed one side of/outside the beaker
  – Light sensor placed other side of/inside the beaker
  – Temperature sensor placed inside the beaker
  – Sensors connected to the ADC/computer
  – Heat source placed below beaker until colour change occurs
  – The sensors feed back data to microprocessor/computer
  – Data is converted from Analogue to Digital
  – Readings are printed out/displayed/ Graphs are <u>automatically</u> produced by computer...
  – ...light plotted against temperature/time   [5]

9   Tick **three** benefits to **workers** of the introduction of robots into car manufacture.

	✓
Once bought robots do not have to be paid	
They have to do less hazardous jobs	
They don't need to lift heavy loads	
They can become deskilled	
It can lead to unemployment	
They work in a cleaner/healthier working environment	
They can work whenever they want	
They get a massive pay rise	

[3]

10   A bank customer wishes to withdraw cash from an ATM.

Describe the computer processing which takes place in the ATM device itself.

....
....
....
....
....
....
....
....
....
....
....
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....
....
.... [7]

10 **Seven** from:
- The customer is asked to type in their PIN
- The ATM checks to see if the card is valid/in date/stolen
- The customer is asked which language/currency they require
- The bank account details are read from the chip
- Customer is asked if they want a receipt
- The typed PIN number is compared with that stored in the chip
- If they are the same the transaction proceeds
- If they are not the same the customer is asked to re-enter PIN
- If three failed attempts transaction rejected and card withheld
- The customer is asked which service is required
- The customer is asked how much money they want to withdraw
- The amount is checked against the card limit
- If transaction is authorised, transaction is completed/if transaction is not authorised, transaction is rejected

[7]

7 Scientists want to find the level of pollution in a river running past a chemical factory. They will use sensors connected to a computer to do this.

(a) Name **three** sensors that the scientists would place in the river.

1 ....

2 ....

3 ....

[3]

(b) Explain why it is so important to carefully consider the position of sensors placed in the river.

....

....

....

....[2]

(c) Describe how the computer would monitor the level of pollution in the river.

....
....
....
....
....
....
....
....
....
....[5]

7 (a) **Three** from:

Temperature sensor
Light sensor
pH sensor
O_2 sensor
CO_2 sensor   [3]

(b) **Two** from:

Need to know values in unpolluted part of river
Need to know values in polluted part of river
Need to place sensors in river above factory
Need to place sensors in river below factory   [2]

(c) **Five** from:

The sensors feed back/send data to microprocessor/computer
Data is converted from Analogue to Digital/sent through an ADC
Readings from above the factory are compared with those from below factory…
…by the computer/microprocessor
Differences/results are printed out
Graphs are <u>automatically</u> produced by computer showing values from below and above factory…
…plotted against time
Process is continuous   [5]

8 A school has introduced a system so that parents of its students can access data about their children.

(a) Give **three** reasons why the school has introduced this system.

1 ....

....

2 ....

....

3 ....

....
                                                                                                            [3]

(b) In order to access this data, parents will need to log on to the school's website.

Describe the purpose of the following two items of data they will need to enter.

User id ....

....

Password ....

....

[2]

---

8 **(a) Three** from:

To save printing costs of reports
To ensure test results, etc. are received by parents
To allow immediate feedback to parents after tests/exams
To keep parents up to date with child's progress/targets   [3]

(b) User id – in order to identify the user to the system/in order for system to assign privileges [1]

Password – in order to allow access to the system if it matches user name   [1]

---

13 (a) Tick **three** components of an expert system.

	✓
Word processor	
Spreadsheet	
Rules base	
Search engine	
Inference engine	
Control software	
Knowledge base	
Presentation software	

[3]

(b) Give **three** examples of applications which use expert systems other than diagnosis systems.

1 ....

2 ....

3 ....

[3]

---

13 (a)

Word processor	
Spreadsheet	
Rules base	✓
Search engine	
Inference engine	✓
Control software	
Knowledge base	✓
Presentation software	

[3]

(b) **Three** from:

Prospecting
Tax
Careers
Chess games
Animal/plant classification/identification

[3]

19 Give **three** specific examples of work that are carried out by a robot in the car industry.

1 ....

....

2 ....

....

3 ....

....

[3]

---

19 Three from:

Putting wheels on cars
Painting car bodies
Welding parts on a car body
Carrying car windscreens/doors
Moving goods in an automatic warehouse
Placing engine block into body
Installing transmission system

[3]

---

9 A chemistry student wants to measure how quickly a liquid cools after it has boiled. She will use a sensor connected to a computer to do this.

(a) Identify **two** variables which will need to be recorded.

1...

2...

[2]

(b) Describe how the computer would process the data into a form the student could use to analyse the results.

....

....

....

....

....

....

....

....

....

....

[5]

9 **(a)** Temperature [1]
   Time [1]

   (b) Five from:

   The sensor feeds back data to computer
   Data is converted from Analogue to Digital
   Readings are stored in a spreadsheet/software package
   Graphs are <u>automatically</u> produced by computer...
   ...plotted against time
   Calculations performed on spreadsheet to show rate of cooling
   Graphs examined to see general overview of rate of cooling [5]

12   Most supermarkets now operate online shopping.

      Discuss the advantages and disadvantages to supermarkets of this development.

....
....
....
....
....
....
....
....
....
....
....
.... [6]

12 **Six** from:

    Initial cost of <u>hardware/software</u> is expensive
    Fewer staff needed – less spent on wages
    Fewer shops needed – less spent on rates/rent/utilities
    Potentially larger customer base
    Need to retrain staff
    Less customer loyalty/loss of customers/more difficult to sell other services/products due to lack
    of personal touch
    Costs of system maintenance
    Greater costs due to more delivery staff/vans [6]

14 (c) Financial models and scientific experiments are examples of different types of modelling applications.

Give **three** other examples of types of modelling.

1 ....

....

2 ....

....

3 ....

....

[3]

(c) **Three** from:

Simulations
Mathematical models
Civil engineering models
Flight/pilot simulation/training
Design of fairground rides
Traffic control
Building fire simulation
Weather forecast models
Population modelling

[3]

5 Tick **two** changes which have occurred in libraries due to the introduction of computers.

	✓
Fewer books can be borrowed.	
Libraries can stay open longer.	
Information about books is more easily available to borrowers.	
More people work at the library.	
Nobody borrows books any more.	
The librarian is automatically notified when books are late.	

[2]

5

Fewer books can be borrowed.	
Libraries can stay open longer.	
More information is more easily available to borrowers.	✔
More people work at the library.	
Nobody borrows books any more.	
The librarian is automatically notified when books are late.	✔

[1]

[1]

8 Many homes in cold climate areas use microprocessor controlled central heating systems.

(a) Name **two** input devices used in such a system.

Input device 1 ....

Input device 2 .... [2]

(b) Describe the processing which takes place.

....

....

....

....

....

.... [3]

---

8 **(a)** Two from:
Temperature sensor
Number pad
Remote control
Touch screen [2]

(b) Three from:
Microprocessor stores required temperature as preset value
Microprocessor receives temperature from sensor
Microprocessor compares temperature from sensor to pre-set temperature
If temperature is lower than preset value microprocessor sends a signal to the actuator...
.... to turn heater on
If higher than preset value microprocessor sends a signal to turn heater off [3]

10 The Geography teacher in a school has set up an automatic weather station connected to a computer.

(a) Name **three** physical variables which will be measured by sensors.

1 ....

2 ....

3 .... [3]

(b) (i) Explain why the computer is unable to read the data directly from the sensors.

....

....

....

.... [2]

(ii) Name the device that is needed to enable it to do so.

.... [1]

(c) Give **three** advantages to the Geography department of having a computerised weather system rather than a manual weather system.

1 ....

....

2 ....

....

3 ....

.... [3]

10 (a) **Three** from:
Humidity
Temperature
Pressure
(Sun)light
Rainfall   [3]

(b) (i) Sensor measures analogue data
Computer works in digital   [1]

(ii) Analogue to digital converter   [1]

(c) **Three** from:
Computer can take readings during holidays
Computer (readings) are more accurate
Students might forget to take readings/readings can be taken at regular intervals
Readings can be taken more frequently
Readings can be taken any time of day or night
Can produce graphs more quickly/automatically   [3]

16 Discuss the advantages and disadvantages to customers of Internet shopping compared to visiting stores to do their shopping.

....

....

....

....

....

....

....

....

....

....

.... [6]

16 **Six** from:

Advantages

Less danger of mugging

Don't have to waste time travelling/queuing

Don't have to spend money on travelling to shops

Greater choice of goods

Can shop when shops are closed

Easier to search and find what you are looking for

Comparison websites will find you the cheapest option

Goods may be cheaper as shops have less staff to pay/less premises to rent

Don't have to pay car parking charges

Don't have to pay for shopping bags

Vouchers/special deals are often only available online/online discounts

Disadvantages

Lack of socialising/social contacts

Hackers may intercept data and defraud customer

Deprived of personal touch

Cannot see/feel goods in reality

More vulnerable to phishing/pharming

Goods sometimes don't arrive/substitute goods may be sent/take longer to arrive/may be delivered to wrong address

Shipping charges

ISP costs/Possible high connection charges

Initial cost of equipment/phone line

Postal costs of returning items

One mark available for reasoned conclusion

Must have at least one advantage and disadvantage to gain full marks   [6]

5   In science lessons, students use sensors connected to computers to find the boiling point of water.

Give **three** advantages of using computers and sensors rather than students taking the temperature readings themselves.

1   ....

....

2   ....

....

3   ....

.... [3]

---

5   **Three** from:
Sensors take _more_ accurate readings
Possibly less danger to students
Students could lose concentration and forget taking some readings
More readings can be taken in a short period of time
Results can be automatically/more quickly produced
Graphs are automatically produced   [3]

---

9   Tick **four** benefits of using robots on car production lines.

	✓
Robots never take breaks	
More workers are employed	
Faster cars are produced	
Standard of the product is more consistent	
Robots never break down	
Robots don't need paying	
No humans are needed	
Greater productivity	

[4]

9

	True	False
Robots never take breaks.	✓	
More workers are employed.		
Faster cars are produced.		
Standard of the product is more consistent.	✓	
Robots never break down.		
Robots don't need paying.	✓	
No humans are needed.		
Greater productivity.	✓	

[4]

12 A school is going to introduce an automatic registration system controlled by computer. Students will carry a card which will be read automatically by an input device every session so that the school office will know that they are present.

(a) Name a suitable input device to read the card.

.... [1]

(b) Instead of using this system the school ICT teacher suggests using student fingerprints.

Describe **two** advantages and **two** disadvantages of such a system.

Advantage 1 ....

....

Advantage 2 ....

....

Disadvantage 1 ....

....

Disadvantage 2 ....

.... [4]

12 **(a)** Chip/magnetic stripe/bar code reader [1]

(b) Advantages – **Two** from:
Unique so students can't check each other in
Students could forget cards
Students could lose cards
Sets of cards may be expensive to buy

Disadvantages – **Two** from:
Students will feel personal liberty infringed/parents might object to children's fingerprints being taken
Method can be slower than cards
Equipment/set up is more expensive
Time taken to gather all the fingerprints would be very long [4]

13 Discuss the advantages and disadvantages, in terms of cost, to customers of using the Internet for home shopping.

....

....

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....

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....

....

.... [5]

13 **Five** from:

Advantages:
Don't have to spend money on travelling to shops
Goods may be cheaper as shops have less staff to pay/less premises to rent
Don't have to pay car parking charges
Don't have to pay for shopping bags
Vouchers/special deals are often only available online
Comparison websites will find you the cheapest option/can compare prices more easily

Disadvantages:
May have to pay delivery charges
Postal costs of returning items
Initial cost of equipment/phone line
ISP costs/Possible high connection charges

Must have at least one advantage and disadvantage to gain full marks.

One mark is available for a reasoned conclusion [5]

14 Describe the effects on people's lifestyles of the use of microprocessor-controlled devices in the home.

....
....
....
....
....
....
....
.... [4]

---

14 **Four** from:
Microprocessor controlled devices do much of housework
Do not need to do many things manually
Do not need to be in the house when food is cooking
Do not need to be in the house when clothes are being washed
Can leave their home to go shopping/work at any time of the day
Greater social interaction/more family time
More time to go out/more leisure time/more time to do other things/work
Are able to do other leisure activities when convenient to them
Can lead to unhealthy eating due to dependency on ready meals
Can lead to laziness/lack of fitness
Can encourage a healthy lifestyle because of smart fridges analyzing food constituents
Microprocessor controlled burglar alarm provides a sense of security
Do not have to leave home to get fit
Manual household skills are lost   [4]

---

17 Describe the role of the microprocessor in an automatic washing machine.

....
....
....
....
....
....
....
....
.... [5]

17 **Five** from:
Microprocessor is programmed with pre-set values
Microprocessor starts cycle at specified time
Microprocessor reads data from sensors
Checks contact switch on door is closed
If it isn't microprocessor will not start the cycle/if it is microprocessor starts cycle
Microprocessor compares sensor readings with pre-set value
If temperature is above pre-set value, microprocessor switches off heater
If temperature is below pre-set value, microprocessor switches on heater
If pressure is greater than preset value, microprocessor sounds alarm
Microprocessor checks pressure reading and calculates the amount of water to use
At start of cycle, microprocessor opens valve to let in water
If water level reached, microprocessor switches off valve
Microprocessor ends cycle at specified time   [5]

18 A theatre has an on-line booking system.
Customers can reserve seats using the Internet with a credit card.
The theatre's computer keeps records of which seats are available.
When the customer pays for a seat the theatre's computer communicates with the credit card company's computer.

(a) Describe **three** checks that the credit card computer will make on the customer's credit card account.

1 ....

....

2 ....

....

3 ....

.... [3]

(b) Describe the processing carried out by the theatre's computer when the credit card company's computer authorises the transaction.

....

....

....

....

....

....

....

.... [4]

18 (a) **Three** from:
Is credit card number valid/exists
Does name entered match that on system
Is expiry/start date valid/matches date stored on system
Does security code/CVV entered match that stored on system
Is there available credit/funds
Checks for unusual spending patterns
Is card blocked/reported stolen/lost [3]

(b) **Four** from:
Looks up required date of performance
Checks that seats are available
Flags seats as being booked
Stores name of customer with seats booked
Sends email confirmation/text
Prints tickets ready to post or to be collected/sends electronic version of ticket
Deducts number of seats booked from number of seats available/reduces number of seats available (by one) [4]

9   Other than communication systems, identify **two** applications which use online processing.

1 ....

2 .... [2]

9   **Two** from:
Buying tickets
Online shopping
Online banking
Any control application
Automatic stock control
(EFT) POS system [2]

12 An online bank keeps customer account data on their computers.

(a) Give **one** way a hacker can use customer accounts to defraud the bank.

1 ....

.... [1]

(b) Give **three** reasons why, despite the risk of hacking, the bank still operates on-line banking.

1 ....

....

2 ....

....

3 ....

[3]

---

12 (a) Can transfer money out of account/Can create bogus account/Can transfer money into bogus account [1]

(b) Three from:
Fewer bank employees, so less paid out in wages
Fewer banks needed – less spent on rates/rent
Less actual cash handled – fewer robberies
Less money spent on security staff
More customers attracted by lower interest rates on loans/higher interest rates on saving accounts [3]

---

15 Computer controlled traffic lights are used at busy road junctions. Light sensors and sound sensors are **not** used to measure traffic flow.

(a) Giving a different reason for each, explain why these sensors are unsuitable.

Sound ....

....

Light ....

.... [2]

(b) Explain the difference between measurement and control when using microprocessors.

....

....

....

.... [2]

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15 (a) Sound – there might be other noises – e.g. roadworks, masking the sound of a car [1]

Light – Anybody could break the beam not just cars/direct sunlight may affect readings [1]

(b) Measurement is the monitoring of physical variables without the microprocessor taking action [1]

Control is when the microprocessor takes action depending on sensor readings [1]

---

17 Doctors use an expert system to help them with their diagnoses of illnesses.

(a) The symptoms are typed in by the doctors.

Describe the processing which the system uses so that it can suggest possible illnesses.

....

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.... [5]

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17 (a) **Five** from:
System/User interface asks questions...
...based on previous responses
Inference engine compares data
Compares data with that held in the knowledge base...
...using rules base
Matches to the symptoms are found [5]

(b) Name **two** applications other than medical diagnosis and car fault diagnosis which involve the use of expert systems.

1 ....

....

2 ....

.... [2]

(b)	**Two** from: Mineral prospecting Tax Careers Chess games Animal/plant classification/identification Computer fault diagnosis	[2]

5   A microprocessor in a greenhouse causes fans to come on when the temperature is higher than the preset value and switches them off when it is lower. It also keeps a record of the temperature throughout the day.

Name **two** types of application software which are being used.

1 ....

2 ....
[2]

5	**Two** from: Control Measuring Spreadsheet	[2]

8   Some students are studying the amount of pollution in a river. They are using a computer to measure the pollution using sensors. The results are recorded and printed.

(a)   Name **two** sensors they should use to measure the amount of pollution.

1 ....

....

2 ....

....
[2]

(b)   Explain why this is not an example of computer **control**.

....

....

....

.... [2]

(c)   Name a type of software which would be used to store the results.

.... [1]

(d)   Name a type of software which would be used to produce a report incorporating graphs.

.... [1]

(e)   Describe the steps involved in monitoring the pollution.

....

....

....

....

....

....

....

.... [4]

15 A mining company has asked a knowledge engineer to devise an expert system to help them with their prospecting for valuable minerals.

Describe how this expert system would be created.

....

....

....

....

....

....

....

....

.... [5]

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15 **Five** from:
Data is gathered/collected from experts
Knowledge base is designed/created
A structure to relate each item in the knowledge base is created
An interrogation technique to access the data is created
A user interface/method of displaying the results/method of inputting data/input screen/output screen is designed/created
The inference engine is designed/created
The rules base is designed/created
The system is tested   [5]

---

16 Internet banking allows customers to transfer money from one account to another and pay bills.

(a) Describe **two** transactions that internet banking does not allow you to make.

....

....

....

....
[2]

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16 (a) **Two** from:
(Cannot) deposit cash
(Cannot) withdraw cash
(Cannot) deposit cheques with most banks   [2]

(b) When logging on, as well as typing in their username and passwords, customers have to provide an answer to a security question.

Tick **two** examples of a security question.

	✓
What is the name of the fourth planet from the Sun?	
What is your favourite place?	
How many miles is it from New York to Washington?	
What is your mother's maiden name?	
Who is the Prime Minister of Australia?	
What is the capital of France?	

[2]

(b)

What is the name of the fourth planet from the Sun?		
What is your favourite place?	✓	[1]
How many miles is it from New York to Washington?		
What is your mother's maiden name?	✓	[1]
Who is the prime minister of Australia?		
What is the capital of France?		

(c) Give **two** drawbacks to the bank of introducing internet banking.

1 ....

....

2 ....

....

[2]

(c) Two from:
Initial cost of hardware/software (is expensive)
Need to retrain staff
Loss of customers/more difficult to sell other services – due to lack of personal touch
System maintenance may be/is expensive/cost of system maintenance   [2]

15 A supermarket uses a computerised stock control system.
This is part of the supermarket's stock file.

Product number	Product name	Number_in_stock	Reorder_level
5011476130069	Wheaters	185	130
0000208097939	Cricket Tea	152	120
0001570248867	Geo garden peas	212	185

It has EFTPOS terminals at each of its checkouts.

(a) Write down the input devices used to read:

(i) The product numbers of the goods bought by customers

.... [1]

(ii) The customer's credit card details

.... [1]

(b) Name the validation check that would be carried out on the product number.

....[1]

(c) Describe the computer processing involved in updating the stock file every time a product is sold and checking whether it needs re-ordering.

....

....

....

....

....

....

....

....[4]

(d) The customer has to type in the PIN to authorise the transaction.

Describe the check that is carried out by the EFTPOS terminal.

....

.... [1]

(e) After the checks on the customer's card have been completed, the supermarket computer contacts the customer's bank.

Describe the computer processing involved in taking payment from the customer's bank.

....

....

....

....

....

....

....

.... [4]

---

15 (a) (i) Bar code reader [1]

    (ii) Chip/magnetic strip readers [1]

(b) Check digit [1]

(c) Four from:
Product number is searched for in stock file
Matching number in stock reduces by 1
Compare number in stock with re-order level
If number in stock is less than re-order level product is re-ordered
Order is automatically sent to supplier [4]

(d) The PIN on the chip is compared with the typed in PIN [1]

(e) Four from:
Bank looks up customer account number
Checks available balance
If insufficient funds then transaction is rejected
If sufficient funds then transaction is authorised
Amount deducted from customer account
Amount credited to supermarket account [4]

---

17 Many bank customers do their banking using the Internet at home. Many transactions can now be done without having to travel to the bank.

   (a) Describe **three** types of transaction which they can do from home.

1 ....

   ....

2 ....

   ....

3 ....

   ....
                                                                                                                [3]

   (b) Identify **one** type of transaction which they cannot do from home.

   ....

   .... [1]

   (c) Give **three** benefits to the **bank** of internet banking.

1 ....

   ....

2 ....

   ....

3 ....

   ....
                                                                                                                [3]

   (d) Give **three** drawbacks to the **bank** of internet banking.

1 ....

   ....

2 ....

   ....

3 ....

   ....
                                                            [3]

17 (a) **Three** from:
Customers can pay bills
Customers can amend/create standing orders/direct debits
Customers can order a new PIN
Customers can stop a cheque
Customers can see recent/pending transactions
Customers can apply for a loan
Have access to up-to-date bank statements/can check account balances
Can transfer funds between the customer's different accounts
Can amend personal details   [3]

(b) Withdraw cash/pay in cash   [1]

(c) **Three** from:
Fewer bank tellers so less paid out in wages
Less actual cash handled – fewer robberies
Have access to a wider customer base
Fewer branch offices needed – less spent on rates/rent/utilities
Less money spent on security staff   [3]

(d) **Three** from:
Initial cost of hardware/software is expensive
Need to retrain staff
Loss of customers/more difficult to sell other services due to lack of personal touch
System maintenance may be expensive/costs of system maintenance   [3]

7   A meal is to be cooked using a microprocessor controlled oven.

(a) Identify **two** variables which have to be pre-set before the cooking begins.

1 ....

2 ....
                                                                                        [2]

(b) Describe the role of the microprocessor in controlling the oven.

....
....
....
....
....
....
....
....
....[5]

7 (a) Temperature   [1]
       Time   [1]

   (b) **Five** from:
       Microprocessor switches heater on
       Microprocessor receives data from temperature sensor
       Temperature of oven is compared with pre-set value by microprocessor
       If higher microprocessor switches heater off
       If lower microprocessor leaves heater on
       Time is constantly monitored by microprocessor
       Time elapsed/finish time is compared to pre-set time by microprocessor
       If equal then heater is switched off by microprocessor…
       …microprocessor causes buzzer to sound   [5]

8 (e) Give **two** reasons, apart from safety, why computer models are often used rather than the
       real thing.

       1 ....

       ....

       2 ....

       ....
                                                                                                    [2]

(e) **Two** from:
    Cost of <u>building real thing</u> may be expensive
    Real thing may waste raw materials/natural resources
    Easier to change data/variables
    Costs less to change data/variables
    The real thing may be impossible to access/create
    Real thing may be on too vast a scale
    Extremes which can't be tested in real life can be tested using models   [2]

10 Tick **four** benefits to banks of using ICT.

	✓
Higher charges can be made	
They have fewer bad risks	
Less paid out in wages as fewer staff need to be employed	
Lower costs as fewer buildings need to be rented	
A wider customer base is available	
Mistakes are never made	
Less actual cash handled so there are fewer robberies	
The initial cost of hardware is cheap	

[4]

10

Higher charges can be made		
They have fewer bad risks		
Less paid out in wages as fewer staff need to be employed	✓	[1]
Lower costs as fewer buildings need to be rented	✓	[1]
A wider customer base is available	✓	[1]
Mistakes are never made.		
Less actual cash handled so there are fewer robberies	✓	[1]
The initial cost of hardware is cheap		

11 A car manufacturer uses robots on its production line.

   (a) Describe **four** disadvantages to the company of using robots to build cars.

1 ....

....

2 ....

....

3 ....

....

4 ....

....

[4]

(b) Identify **two** changes to the workers' working environment that the use of robots has brought about.

1 ....

....

2 ....

....

[2]

---

11 (a) Four from:

Robots have to be reprogrammed when there is a small change/can't think for themselves
Robots need programming in order to be adaptable
Expensive start-up costs – redundancy payments
Expensive start-up costs – have to spend money on training workers to use robots
Expensive start-up costs – buying of robots/programming of robots
Computer crash would halt production
Maintenance/repair costs can be expensive   **[4]**

(b) Two from:

It is quieter
They have a safer environment
It is a cleaner environment   **[2]**

---

12 Tick **two** applications which use on-line processing.

	✔
Producing the payroll	
Producing utility bills	
Printing credit card statements	
Paying for goods using EFTPOS	
Processing bank cheques overnight	
A microprocessor controlled greenhouse	

[2]

12

Producing the payroll		
Producing utility bills.		
Printing credit card statements.		
Paying for goods using EFTPOS.	✔	[1]
Processing bank cheques overnight		
A microprocessor controlled greenhouse.	✔	[1]

15 The use of microprocessor-controlled devices in the home affects an individual's leisure time, social interaction and the need to leave the home.

(a) Give **three** advantages to the individual when microprocessor-controlled devices are used in the home.

1 ....

....

2 ....

....

3 ....

....
[3]

(b) Give **three** disadvantages to the individual when microprocessor-controlled devices are used in the home.

1 ....

....

2 ....

....

3 ....

....
[3]

15 (a) **Three** from:
Microprocessor controlled devices do much of housework
Do not need to do many things manually
Do not need to be in the house when food is cooking
Do not need to be in the house when clothes are being washed
Can leave their home to go shopping/work at any time of the day
Greater social interaction/more family time
More time to go out/more leisure time/more time to do other things/work
Are able to do other leisure activities when convenient to them
Microprocessor controlled burglar alarm provides a sense of security
Do not have to leave home to get fit
Can encourage a healthy lifestyle because of smart fridges analyzing food constituents   **[3]**

(b) **Three** from:
Can lead to unhealthy eating due to dependency on ready meals
Can lead to laziness/lack of fitness
Manual household skills are lost
These may malfunction and, because the individual has left the device unattended, this can lead to fires/damage to the house
    [3]

10 (a) Describe batch processing of data, using the processing of bank cheques as an example.

....

....

....

....

....

....

....

.... [4]

(b) Explain why the booking of airline tickets using batch processing would **not** be a good idea.

....

....

....

....

....

.... [3]

---

10 (a) **Four** from:

Data/cheques are collected together
during the course of the day
Data/cheques are then processed all at once
Data/cheques are processed overnight
Dank accounts updated following morning
No human intervention [4]

(b) **Three** from:

It might lead to double booking
Customer would not be sure booking has been successful
Would take a long time to receive confirmation/ticket
Processing would take a long time…
… would cost company money [3]

11 Robots are now used on many car production lines.

Tick **four** ways that their use has affected workers in the car industry.

	✓
More technical staff have been employed	
Car workers can have more breaks	
Car workers have to lift all the heavy parts	
Car workers get paid less	
Car workers have been made unemployed	
Car workers have had to be retrained	
Work areas are dirtier	
There are fewer manual tasks to do	

[4]

11

	✓
More technical staff have been employed	✓
Car workers can have more breaks	
Car workers have to lift all the heavy parts	
Car workers get paid less	
Car workers have been made unemployed	✓
Car workers have had to be retrained	✓
Work areas are dirtier	
There are fewer manual tasks to do	✓

[4]

12   **(e)** Spreadsheets are often used to produce computer models.

Give **three** reasons why computer modelling is used instead of the real thing.

1 ....

....

2 ....

....

3 ....

.... [3]

(e) **Three** from:

Some situations are/real thing might be dangerous/ model is less dangerous
Cost of building real thing may be expensive
Real thing may waste raw materials/natural resources
Easier to change/modify
Costs less to change data/variables
The real thing may be impossible to access/create
Real thing may be on too vast a scale
It may take a long time to obtain results from the real thing
Extremes which can't be tested in real life can be tested using models   [3]

5   Microprocessors are used in different applications to control the process or to simply gather data (measurement only).

Tick which of the following applications are examples of control or of measurement only.

	Control	Measurement only
Automatic cookers		
Weather stations		
Microwave ovens		
Automatic washing machines		

[4]

5

	Control	Measurement only
Automatic cookers	✔	
Weather stations		✔
Microwave ovens	✔	
Automatic washing machines	✔	

[4]

9 Robots are now used on many car production lines.

Describe **three** advantages of this to a car company.

1 ....

....

2 ....

....

3 ....

.... [3]

---

9 **Three** from:

Car production is more consistent/robots produce the same standard every time
Cost – once bought they do not have to be paid/fewer employees so lower costs/don't have to pay robots wages/lower running costs
No industrial disputes
Greater productivity
Greater accuracy/robots are more accurate
Can work in hazardous/extreme conditions/can lift heavier loads
Robots don't take breaks/can work 24 hours a day 7 days a week/can work continuously   [3]

10 (a) Car mechanics often use expert systems to help them to diagnose faults with car engines.

Tick **four** components of a typical expert system.

	✓
Graph plotter	
Inference engine	
Interactive input screen	
Knowledge base	
Rules base	
Scanner	
Spreadsheet	
Web cam	

[4]

10 (a)

	✓
Graph plotter	
Inference engine	✓
Interactive input screen	✓
Knowledge base	✓
Rules base	✓
Scanner	
Spreadsheet	
Web cam	

[4]

(b) Name **two** other applications which involve the use of expert systems.

1 ....

....

2 ....

.... [2]

(b) Two from:

Medical diagnosis
Prospecting
Tax
Careers
Chess games
Animal/plant classification/identification [2]

18 A supermarket has a number of EFTPOS terminals.

Explain what is meant by EFTPOS and how such a system works.

....

....

....

....

....

....

....

....

....

....

.... [6]

18 **Six** from:

Electronic Funds Transfer at Point of Sale
Enables payment for goods at a checkout using credit/debit cards
Goods are purchased and bill is calculated
Customer inserts card into chip reader
Card is checked for validity/reported stolen
PIN is entered
PIN is compared with that stored on the chip
If PIN is OK/verified transaction is authorised
If not, customer is asked to re-enter PIN
Supermarket computer contacts customer's bank
Checks if sufficient funds
If sufficient funds, transaction is completed/if not, transaction is rejected
Amount deducted from customer's bank account
Amount credited to supermarket's bank account
The supermarket EFTPOS terminal produces a receipt [6]

11 Car mechanics often use an expert system to help them with their work in diagnosing car engine faults.

Describe how this system would work.

....

....

....

....

....

....

....

....

.... [5]

---

11 **Five** from:

Data is read by sensors/downloaded from onboard computer/entered using keyboard/touch screen/answers to questions are typed in
Uses interactive interface/Asks questions...
........based on previous responses
Expert system analyses data
Inference engine compares data
Compares data with that held in the knowledge base.......
.... using rules base
Matches are found
System suggests possible faults/solutions   [5]

---

12 A house has a microprocessor controlled central heating system.

(a) Describe the use of the following input devices in such a system.

Keypad ....

....

Sensor ....

.... [2]

(b) Describe how the microprocessor would use the data from these devices to control the system.

....

....

....

....

....

....

....

.... [4]

---

12 (a) Two from

    Keypad to input required temperature
    Sensor to input current temperature of the room   [2]

(b) Four from:

    Microprocessor stores required temperature as preset value
    Compares temperature from sensor to pre-set temperature
    If temperature is lower than preset value microprocessor sends a signal to turn heater on
    If higher than preset value microprocessor sends a signal (to the actuator) to turn heater off
    If values are equal microprocessor does nothing
    Wait set period of time before looping   [4]

15

(f) Spreadsheets are often used to produce computer models. There are however, other forms of models such as simulations.

Explain, using air pilot training as an example, what is meant by simulation.

....

....

....

....

....

.... [3]

(f) Three from:

    Creating a model of a real system (such as a cockpit)…
    …in order to study the behaviour of the system/pilot reactions
    Is able to predict/react to the behaviour of the system or pilot
    The cockpit simulation has all the controls normally found in an actual cockpit
    Creating models of situations that pilots might meet in real life/Creates whatif scenarios   [3]

18 Robots are now used on many car production lines.

Discuss the benefits and drawbacks to the car company of using robots.

....
....
....
....
....
....
....
....
....
....
....
....
.... [7]

18 **Seven** from:

Car production is more consistent/robots produce the same standard every time
Cost – once bought they do not have to be paid/fewer employees so lower costs/don't have to pay robots wages/lower running costs
No industrial disputes
Greater productivity
Greater accuracy/robots are more accurate
Can work in hazardous/extreme conditions/can lift heavier loads
Robots don't take breaks/can work 24 hours a day 7 days a week/can work continuously
Robots have to be reprogrammed when there is a small change/can't think for themselves
Robots need programming in order to be adaptable
Expensive start up costs – redundancy payments
Expensive start up costs – have to spend money on training workers to use robots
Expensive start up costs – buying of robots/programming of robots
Computer crash would halt production
Maintenance/repair costs can be expensive   [7]

3 Tick **True** or **False** next to each of these statements.

	True	False
Withdrawing money from an ATM is an example of batch processing.		
The processing of bank cheques is an example of batch processing.		
Booking a theatre ticket is an example of online processing.		
Producing utility bills is an example of online processing.		

[4]

3

	TRUE	FALSE	
Withdrawing money from an ATM is an example of batch processing		✓	[1]
The processing of bank cheques is an example of batch processing	✓		[1]
Booking a theatre ticket is an example of online processing	✓		[1]
Producing utility bills is an example of online processing		✓	[1]

11 Hospitals often use computers to continuously monitor patients.

(a) Describe the monitoring process.

....
....
....
....
....
....
....
.... [4]

(b) Give **four** advantages of using a computer rather than nurses to monitor patients.

1 ....
....
2 ....
....
3 ....
....
4 ....
.... [4]

11 (a) **Four** from:

Sensors are used to monitor patient's vital signs
...such as temperature, blood pressure, pulse, sugar levels (2 required for mark)
Sensors send data/signals back to computer
ADC converts analogue signals from sensors...
...to digital so that computer can understand/read the data
Graphs are output
Inputs are compared to acceptable range of values
If higher/lower warning signal is triggered [4]

11 (b) **Four** from:

Readings can be taken more frequently
Nurses can get tired and forget to take readings/nurses are so busy they might not be able to take readings regularly
Computer readings are more accurate/human errors are reduced
More than one variable can be measured at any one time
Results can be analysed automatically/Charts are produced automatically
Automatic warnings can be generated/faster to react
Nurses are free to do other tasks
Reduces chances of nurses being exposed to contagious diseases
Reduced cost of wage bill/fewer nurses will be needed [4]

(f) Spreadsheets can be used for modelling.

Give **three** reasons why computer models are used rather than the real thing.

1 ....
....
2 ....
....
3 ....
.... [3]

12 (f) **Three** from:

Real thing may be too expensive to build/cost of rebuilding/repairing is expensive
Real thing requires too large a time scale/it may take a long time to obtain results from the real thing
Real thing would be too wasteful of materials
Real thing is too vast a scale
Easier to modify/change date/variables
Costs less to change data/variables
The real thing may be impossible to access/create
Real thing may be too dangerous
You can test predictions more easily/model can make predictions more accurately
You can ask many what if questions which would be impractical in real life [3]

15 Floyd has purchased a laptop computer. He wants to use it for Internet banking.

(a) Explain why Floyd would need the following two items.

Browser ....

....

ISP ....

.... [2]

(b) Discuss the advantages and disadvantages to customers of using Internet banking rather than visiting the bank.

....
....
....
....
....
....
....
....
....
.... [6]

---

15 (a) Two from:

Browser to access bank's website	[1]
ISP to have access to internet	[1]

(b) Six from:

Advantages
Don't have to waste time travelling (long distances) to banks
Don't have to spend money on travelling expenses travelling (long distances) to banks
No embarrassment of having to ask for loans face to face
Can bank when banks are closed
Can use it anywhere if there's an internet connection

Disadvantages
May not like the lack of personal touch
There may be less opportunity for socialising with friends/neighbours
Possibly more expensive phone bills
Hackers can access personal details and transfer money to their account
You have to have Internet access
Unable to withdraw cash

One mark is available for a reasoned conclusion
Maximum four advantages or disadvantages   [6]

18 There are many microprocessor-controlled devices in the modern home.

Describe **five** effects of these devices on people's lifestyles.

1 ....

....

2 ....

....

3 ....

....

4 ....

....

5 ....

.... [5]

18 **Five from:**

Microprocessor controlled devices do much of housework
Do not need to do many things manually
Do not need to be in the house when food is cooking
Do not need to be in the house when clothes are being washed
Can leave their home to go shopping/work at any time of the day
Greater social interaction/more family time
More time to go out/more leisure time/more time to do other things/work
Are able to do other leisure activities when convenient to them
Can lead to unhealthy eating due to dependency on ready meals
Can lead to laziness/lack of fitness
Can encourage a healthy lifestyle because of smart fridges analysing food constituents
Microprocessor controlled burglar alarm provides a sense of security
Do not have to leave home to get fit
Manual household skills are lost/deskilling regarding household tasks   [5]

11 A greenhouse is controlled by a computer.

(a) Other than a temperature sensor name **two** sensors used in the greenhouse.

1 ....

2 .... [2]

(b) Explain why computers are unable to read the data directly from these sensors.

....

....

....

.... [2]

(c) Describe what is meant by a pre-set value and how it is used by the computer to help it control the temperature of the greenhouse.

....

....

....

....

....

....

....

.... [4]

---

11 (a) <u>Two</u> from:

Humidity
Moisture
Light
pH   [2]

(b) Sensors send analogue data to computer   [1]
Computer works in digital   [1]

(c) The preset value is the (required) value input by the user/already stored in the computer   [1]

<u>Three</u> from:

temperature is compared with preset value
if lower than preset value computer switches on heater
if lower than preset value computer shuts windows
if higher than preset value computer switches heater off
if higher than preset value computer switches fan on
if higher than preset value computer opens window   [3]

---

12 A store uses EFTPOS terminals at all of its checkouts.

(a) Identify **two** input devices which would be used at each EFTPOS.

1 ....

2 .... [2]

(b) Describe the computer processing which takes place in order to determine if a product needs re-ordering.

....

....

....

....

....

....

....

.... [4]

12 (a) Two from:

Bar code reader
Key/number pad
Weighing scales
Touch screen
RFID reader
Magnetic Stripe reader
Chip and PIN reader   [2]

(b) Four from:

The stock file is searched
Until a match is found with the entered bar code number/product id number
The number in stock of the matching record is read
One is subtracted from the number in stock
The number in stock is compared with the re-order number
If it is equal to the re-order number
More goods are automatically re-ordered
The new value of number in stock is written back to the file   [4]

16 A company decides to introduce robots to the production line to manufacture cars.

Discuss the advantages and disadvantages to the workers of introducing robots rather than using humans to manufacture cars.

....

....

....

....

....

....

....

....

....   [5]

16 **Five** from:

Advantages
Safer environment
Don't need to lift heavy loads/Fewer manual tasks to do
Cleaner/healthier working environment
Can lead to retraining to improve skills
More technical jobs available

Disadvantages
Can lead to unemployment
Deskilling can occur

One mark is available for a reasoned conclusion   [5]

10 Many people now use internet shopping sites.

(a) Apart from not having to travel, give **three** benefits to the customer of internet shopping.

1 ....

....

2 ....

....

3 ....

....   [3]

(b) Apart from data security give **three** drawbacks to the customer of internet shopping.

1 ....

....

2 ....

....

3 ....

.... [3]

10 (a) Three from:
Less danger of mugging
Can shop when shops are closed
Doesn't have to spend time queuing/going around different shops
Can compare prices at different shops more easily
Can look at wide range of shops
Easier to search and find what you're looking for   [3]

(b) Three from:
Lack of socialising/social contacts
Customers must have a computer/Internet access/(basic) computer skills
Deprived of personal touch
Phone bills can increase
Without broadband other family members cannot use the phone
Cannot see/feel goods in reality   [3]

13 Computers are used in supermarkets at checkouts.

(a) Identify **three** output devices which could be used when an item is purchased.

1 ....

....

2 ....

....

3 ....

.... [3]

When paying for goods the customer uses a bank card.

(b) Identify the input device which will be used to directly input data from the card.

.... [1]

(c) Describe the processing which takes place during an electronic funds transfer. Include reasons why the card might be rejected.

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....
....
....
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....
....
....
....
.... [7]

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13 **(a)** **Three** from:
Printer
Monitor
Speaker/buzzer
LCD display   **[3]**

(b) Chip reader/magnetic stripe reader   **[1]**

(c) **Seven** from:
Details from customer's card processed
PIN is compared with that stored on the chip
Card is checked for validity/reported stolen
If PIN is OK/verified transaction is authorised
(Bank code allows) shop computer to contact bank's computer
Account checked for sufficient funds
If insufficient funds/ over the credit limit then transaction/card is rejected/If sufficient funds then transaction is authorised
Amount deducted from customer's bank account
Amount credited to shop's bank account
Itemised receipt printed out

Card might be rejected if:
PIN entered incorrectly
Past its expiry date
Registered as stolen
Physical damage to chip
Unusual spending patterns
Unable to use some cards abroad   **[7]**

16 Libraries make use of both batch processing and online processing.

Describe the differences between these types of processing giving examples of situations where each would be used in a library.

....

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....

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....

.... [6]

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16 **Six** from:

Batch processing:
data are collected together
during the course of the day
then processed all at once
processed overnight
letters sent to borrowers who are overdue
letters sent to borrowers following morning
no human intervention

Online processing
results in immediate updating of records
book details inputted as soon as book borrowed/returned
records are searched until match is found
recorded as being borrowed/returned   [6]

10 Below is a diagram of a river running past a chemical factory. The same types of s̶ ̶ ̶Camb
connected to a computer in the factory are placed at A and B to monitor pollution o̶
river by the factory.
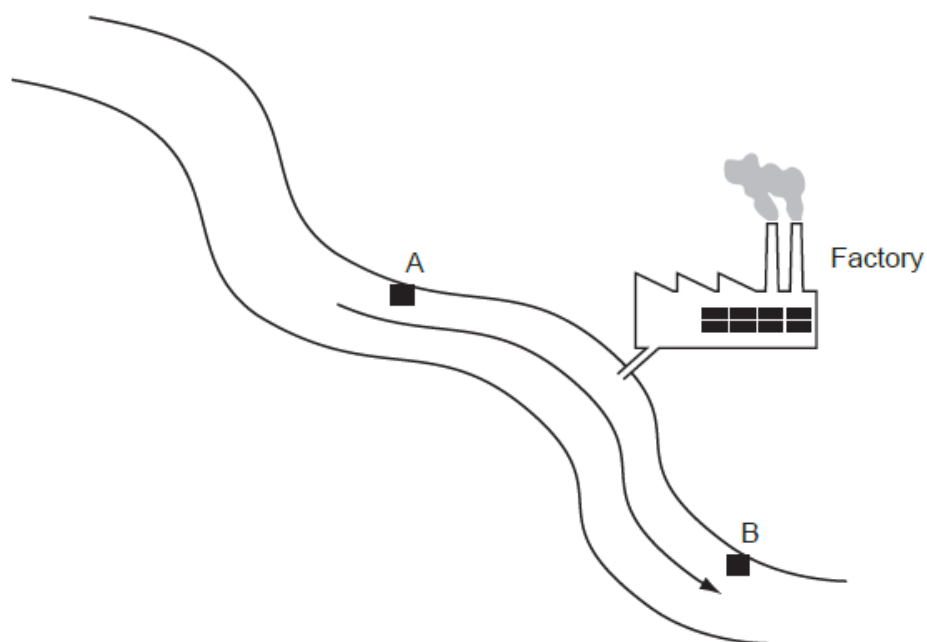
(a) Name **three** sensors which would need to be placed at both A and B.

1 ....

2 ....

3 .... [3]

(b) Describe how the computer would monitor the level of pollution in the river.

....

....

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....

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....

.... [5]

10 (a) **Three** from:
Temperature sensor
Light sensor
pH sensor
O_2 sensor
CO_2 sensor [3]

(b) **Five** from:
The sensors feed back data to microprocessor/computer
Data is converted from Analogue to Digital
Readings from A are compared with those from B...
.....by the computer/microprocessor
Differences are printed out
Graphs are <u>automatically</u> produced by computer showing values from A and B..
...plotted against time
Process is continuous. [5]

11 (a) Doctors often use expert systems to help them to diagnose illnesses.
Name **four** components of a typical expert system.

1 ....

2 ....

3 ....

4 .... [4]

(b) Name **two** other applications which involve the use of expert systems.

1 ....

....

2 ....

.... [2]

11 (a) **Four** from:
User interface
Rules base
Knowledge base
Inference engine [4]

(b) **Two** from:
Engine car fault diagnosis
Prospecting
Tax
Careers
Chess games
Animal/plant classification [2]

(e) Spreadsheets are often used to produce computer models.
Discuss the benefits and drawbacks of computer modelling.

....

....

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....

....

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....

.... [4]

(e) **Four** from:
Benefits
Real thing may be too expensive to build
Real thing requires too large a time scale
Real thing would be too wasteful of materials
Real thing is too vast a scale
Easier to change data/variables
Costs less to change data/variables
The real thing may be impossible to access/create
Real thing may be too dangerous
You can test predictions more easily/model can make predictions more accurately
you can ask many whatif questions which would be impractical in real life

Drawbacks
Can never allow for all eventualities
Difficult to exactly recreate a lifelike situation
Hardware and software may be expensive
Workers will need to be trained to use the system

Max. 3 drawbacks or benefits   [4]

10 Describe how the components of an expert system are used to help a doctor to d an illness.

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.... [6]

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10 **Six** from:
Symptoms are entered using the user interface
User interface displays questions...
...based on previous responses
User answers questions using user interface
inference engine compares symptoms
compares symptoms with those in the knowledge base
compares symptoms using rules base…
…matches of symptoms are found
User interface/screen displays possible diagnoses/illnesses/probabilities   [6]

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11 A bank uses a chip and PIN system at its ATMs. A customer withdraws cash by inserting their bank card. Write down the steps involved in the computer processing of the transaction.

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.... [6]

11 **Six** from:
The customer is asked to type in their PIN
The (ATM) checks to see if the card is valid
The customer is asked which language/currency they require
The bank account details are read from the chip
Customer is asked if they want a receipt
The typed PIN number is compared with that stored in the chip
If they are the same the transaction proceeds
If they are not the same the customer is asked to re-enter PIN
If three failed attempts transaction rejected and card withheld
The customer is asked which service is required
The customer selects required service (cash)
The customer is asked how much money they want to withdraw
The customer's account is checked to see if it has sufficient funds
The amount is checked against the card limit
If there are sufficient funds (and the amount is within the card limit) the transaction is authorised/if not transaction is rejected
The amount is deducted from the customer account
The bank notes are issued
The card is returned (by the computer)
If required receipt is printed.   [6]

12 A house has a microprocessor controlled burglar alarm.

(a) Identify **three** input devices which would be used in this system to feed data back the microprocessor.

1 ....

2 ....

3 .... [3]

12 (a) **Three** from:
Temperature sensor
Infra red sensor/Movement sensor/camera/motion sensor
light sensor
Pressure sensor/pad
Contact switch
Sound sensor/microphone
key pad/touch screen
Biometric devices   [3]

(b) Describe how a microprocessor would use these devices to detect the presence of an intruder and what action it would take.

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....
....
....
....
....
....
....
....
.... [5]

(b) **Five** from:
Microprocessor checks input from the user is authentic
Microprocessor (continually) monitors sensors.
If light/infra red sensor reading changes
If movement sensor activated...
If contact switch activated...
If pressure greater than pre-set value.....
If sound greater than pre-set value.....
If temperature greater than pre-set value....
Microprocessor sends signal to sound alarm
Microprocessor sends signal to flashing light/house lights.
Microprocessor sends signal automatically to police
Microprocessor automatically sends message/calls/texts owner   [5]

10 Describe online processing of data, using the booking of airline tickets as an example.

....

....

....

....

....

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....

.... [4]

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10 Four from:
User/customer is in direct contact with the main computer/CPU
Appears that nobody else can access system at that point/processing is almost immediate
Computer asks customer for details of flight
Computer asks for personal details of passengers
Computer searches for matching flights
Computer may display list of seats available
Computer may ask customer to select a seat
(Customer selects seat from those available and) computer flags seat as booked
Computer asks customer to complete payment details
Computer checks details are valid by communicating with customer's bank
Computer checks if sufficient funds
Airline's database is updated immediately
Number of seats available reduces by number booked
Prevents double booking
Confirmation/e-ticket may be sent to customer by email   [4]

15

(e) Paul could extend this spreadsheet to calculate his total profit. He could then use it as a model.
Give **two** reasons why financial models are used.

1 ....

....

2 ....

          [2]

....

(e) **two** from:
can see what will happen without spending a lot of money
results can be seen in a shorter space of time
you can ask many whatif questions which would be impractical in real life
Easier to change data/variables
You can test predictions more easily/model can make predictions more accurately   [2]

8   Tick whether the following statements apply to **online** processing or **batch** processing.

	online	batch
Paying for goods at an EFTPOS		
Producing electricity bills		
Booking a holiday		
Producing payslips		

[4]

8

	Online	Batch	
Paying for goods at an EFTPOS	✔		[1]
Producing electricity bills		✔	[1]
Booking a holiday	✔		[1]
Producing payslips		✔	[1]

12 A greenhouse is controlled by a microprocessor.

(a) Other than a light sensor name **two** sensors used in the greenhouse.

1   ....

2   .... [2]

(b) Explain why computers are unable to read the data directly from these sensors and name the device which would enable them to do so.

....
....
....
....
....
.... [3]

(c) Describe how the microprocessor uses data from the light sensor.

....

....

....

....

....

....

....

.... [4]

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12 (a) **Two** from:

Temperature
Humidity
Moisture
pH   [2]

(b) Sensor measures analogue   [1]
Computer works in digital   [1]
Analogue to digital converter   [1]

(c) **Four** from:

microprocessor compares light reading with preset value
if lower than pre-set value microprocessor sends signal to switch on light bulb
if higher than pre-set value microprocessor sends signal to switch off light bulb
process is continuous/ monitoring of sensors is continuous   [4]

---

13 Computers are used in supermarkets at point of sales terminals. When paying for go~~ods~~
customer inserts the bank card into the chip reader.

(a) Identify **three** items of data contained in the chip on a bank card.

1 ....

2 ....

3 .... [3]

(b) Describe **three** checks that would be carried out using information on the card before
the bank is asked to authorise the transaction.

1 ....

....

2 ....

....

3 ....

.... [3]

(c) Describe **five** steps which would be carried out by the computers at the supermarket and at the customer's bank to complete the transaction.

1 ....

....

2 ....

....

3 ....

....

4 ....

....

5 ....

.... [5]

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13 (a) Three from:

Card number
PIN
Expiry date
Type of card/issuer
Security number [3]

(b) Three from:

Card is valid/card number exists
Card is in date
PIN entered matches that on card
Checks if card is stolen [3]

(c) Five from:

Customer bank contacted
Bank looks up customer account number
Checks available balance
Checks daily (card) limit
If insufficient funds then transaction is rejected
If sufficient funds then transaction is authorised
Money deducted from customer account
Money credited to supermarket account [5]

16 A company uses robots to manufacture cars.

(a) Tick **four** advantages to the company of using robots rather than humans to manufacture cars.

	✓
Robots are cheap to buy	
Running costs are lower as humans have to be paid wages	
Robots never need maintenance	
Humans cannot work continuously	
Robots can work in hazardous conditions	
There is lower productivity with robots	
Robots produce the same standard of finished product every time	
Humans have greater accuracy than robots	

[4]

(b) Describe **three** tasks that humans will have to do when robots are used to manufacture cars.

1 ....
....
2 ....
....
3 ....
.... [3]

16 **(a)**

Robots are cheap to buy	
Running costs are lower as humans have to be paid wages	✓
Robots never need maintenance	
Humans cannot work continuously	✓
Robots can work in hazardous conditions	✓
There is lower productivity with robots	
Robots produce the same standard of finished product every time	✓
Humans have greater accuracy than robots	

[4]

(b) **Three** from:

Programming robots
Changing robot arm tools/end effectors
Maintaining robots
Supervising operations
Quality control/inspecting finished cars   [3]

8 A geography teacher wants to build a weather station. She wants to use a comp[...] collect the results.

(a) Describe **three** physical variables which would be measured.

1 ....

....

2 ....

....

3 ....

.... [3]

(b) The geography teacher wants to create a model to demonstrate basic weather forecasting to her students.
Describe **three** features of a spreadsheet which make it suitable for modelling purposes.

1 ....

....

2 ....

....

3 ....

.... [3]

(c) Describe **three** other uses of modelling.

1 ....

....

2 ....

....

3 ....

.... [3]

(d) Give **two** reasons, other than reducing timescale, why computer mode~~~ sometimes used rather than the real thing.

1 ....

....

2 ....

.... [2]

8 (a) **Three** from:

Descriptions of:

Temperature
Pressure
Sunlight
Humidity
Rainfall [3]

(b) **Three** from:

Descriptions of:

Uses text and numbers
Performs automatic recalculation
Performs whatifs
Replicates formulae
Formulae/functions
Can have absolute and relative cell references/named cells or ranges
Graphs/charts [3]

(c) **Three** descriptions from:

Simulations
Mathematical models
Scientific models
Civil engineering models
Financial models
Flight/pilot simulation/training
Large scale chemical experiments
Design of fairground rides
Traffic control
Building fire simulation [3]

(d) **Two** from:

Some situations are/real thing might be dangerous/model is less dangerous
Cost of building real thing may be expensive
Real thing may waste raw materials/natural resources
Easier to change data/variables
Costs less to change data/variables
The real thing may be impossible to access/create
Real thing may be on too vast a scale
Extremes which can't be tested in real life can be tested using models   [2]

10 A company owns several stores which offer internet shopping to customers.

(a) Give **three** advantages to the company of internet shopping.

1 ....

....

2 ....

....

3 ....

.... [3]

(b) Give **three** disadvantages to the company of internet shopping.

1 ....

....

2 ....

....

3 ....

.... [3]

10 (a) Three from:

Fewer staff needed – less spent on wages
Fewer shops needed – less spent on rates/rent/utilities
Less actual cash handled – fewer robberies
Less money spent on security staff
Potentially larger customer base   [3]

(b) **Three** from:

Initial cost of hardware/software is expensive
Need to retrain staff
Less customer loyalty/loss of customers/more difficult to sell other services/product due to lack of personal touch
Costs of system maintenance
Greater costs due to more delivery staff   [3]

8   A greenhouse is controlled by a microprocessor.

   (a) Tick **three** physical variables that would be monitored.

	✓
Humidity	
Temperature	
Pressure	
Wind speed	
Light	
Wind direction	

[3]

   (b) Explain the difference between measurement and control.

   ....

   ....

   ....

   .... [2]

   (c) Give **four** advantages of using a computer rather than allowing the students to control the growing conditions.

   1 ....

   ....

   2 ....

   ....

   3 ....

   ....

   4 ....

   .... [4]

8 **(a)**

Humidity	✓
Temperature	✓
Pressure	
Wind speed	
Light	✓
Wind direction	[3]

(b) Measurement is the monitoring of physical variables without the microprocessor taking action [1]

Control is when the microprocessor takes action depending on sensor readings [1]

(c) Four from:

Computer (readings) are more accurate than students
Students might forget to take readings/readings can be taken at regular intervals
Computer takes more reliable readings
Readings can be taken/control can be carried out more frequently
Readings can be taken/control can be carried out any time of day or night
Computers can respond to changes immediately/quicker than students
Students might be unavailable to take readings during school holidays/computers can work continuously/without taking a break [4]

9 **(f)** This spreadsheet is an example of a financial model.
Give **two** examples of computer models, other than financial models.

1 ....

....

2 ....

.... **[2]**

(g) Tick **three** reasons why computer models are used.

	✓
The real thing may need too large a timescale.	
Computer models waste a lot of raw materials.	
The real thing is quicker to build.	
If a computer model fails it does not need rebuilding.	
Once a computer model is built it does not cost a lot to run.	
A model does not cost anything to make.	

[3]

(f) **Two** from:

Simulations
Mathematical models
Scientific models
Civil engineering models **[2]**

(g)

The real thing may need to large a timescale	✓
Computer models waste a lot of raw materials	
The real thing is quicker to build	
If a computer model fails it doesn't need rebuilding	✓
Once a computer model is built it doesn't cost a lot to run	✓
A model doesn't cost anything to make	**[3]**

11 Many banks offer internet banking. To access this online service customers have to [log on] to the system.

(a) Explain why authentication techniques are necessary.

....
....
....
....
....
.... [3]

(b) Customer data is encrypted. Explain what encryption is and why it is used.

....
....
....
....
....
.... [3]

---

11 (a) Three from:

Authentication techniques such as user names and passwords identify the user to the system
Without authentication anybody would be able to access data
Hackers would be able to amend/delete data without being prevented
Would have to rely on other methods such as firewalls to prevent unauthorised access.   [3]

(b) Three from:

Causes data to be scrambled/encoded
Requires an encryption key/software to encrypt
Requires a decryption key/encryption software to decrypt
Results in data which is not understandable/readable
Protects sensitive data…
… from being understood if it falls in to the wrong hands   [3]

14 Sarbjit has a desktop computer at home which he uses for internet banking.

    (a) Identify **two** other computer systems he could use to do internet banking when away from home.

  1 ....

    ....

  2 ....

    .... [2]

    (b) Discuss the advantages and disadvantages to banks of using internet banking.

      ....

      ....

      ....

      ....

      ....

      ....

      ....

      ....

      ....

      ....

      ....

      .... [6]

15 Give **four** advantages to bank customers of using ATMs rather than going to the bank to withdraw cash.