**Answers**

1. Jack has started a business manufacturing parts for high performance cars. The business has 20 employees who work in manufacturing and 10 employees who work in the office with responsibilities for administration, sales and marketing. These employees each have their own computers.

Describe **two** roles of the operating system in the office employee’s personal computers. [4]  
  
Any two sentences from below:

The operating system is a collection of programs / software (1) which manages the software/applications/apps and hardware on a computer (1).

It handles requests from the application software to use the processor (1) and shares processing resources between different tasks/programs (if multi-tasking) (1).

It manages the use of internal memory / RAM (1) and virtual memory (1)..

It manages security, (1) e.g. use of passwords / file access (1)

It manages network management (1) including remembering Wi-Fi passwords / networks / queuing packets of information (1)..

It handles the input and output from hardware and peripheral devices (1) with device drivers (1)

2. The manufacturing plant uses high precision, computer-controlled machines and robotics. These machines use a real-time operating system.

(a) Explain **one** reason why this type of operating system needs to be used. [2]  
  
The real-time operating system will obtain information from sensors (1) which it will need to react to within a certain amount of time (1) or a problem/damage may occur (1). It is not possible to queue these activities to occur at a later time (1).

(b) The computers in the office allow more than one program to be run at a time.

(i) State what type of operating system needs to be used to accomplish this. [1]  
  
Multi-tasking (accept single-user multi-tasking or multi-user multi-tasking). (1)

(ii) Describe how it is possible for a computer with one CPU to run many programs   
at the same time. [5]  
  
Each program is moved into a location in RAM (1) assigned by the operating system (1). The operating system will allow a task/program a period of time when the CPU can run it (1). At the end of this time, all the data on the CPU will be moved to RAM (1) and the program will be blocked/paused from running on the CPU (1). The next program now gets an opportunity to run on the CPU (1). By switching between tasks very quickly the user experiences that all the programs are running at the same time (1).

(c) The computers in the office have connected peripheral devices such as keyboards, monitors and mice  
  
Describe how the operating system manages peripheral devices. [4]  
  
The operating system uses device drivers to communicate with devices (1). One device driver is required for each device (1). The device driver sends signals / interrupts to the hardware (1). These are translated so that the software can understand them (1). When a signal is received from a device, it will be put in a queue until the operating system is ready to deal with it (1).

(d) The operating system used on the office computers provides a number of security features. Explain **two** of these features. [4]  
  
Password protection (1) allows each user to have a password. They will only be able to log in if they use the password that matches their username (1)

File access protection (1) allows different files/folders to be protected so that only certain users/groups can access them (1)

(inbuilt software) firewalls (1) can allow malicious traffic / traffic to close ports to be rejected (1)

(inbuilt) antimalware/antivirus software (1) can detect/remove viruses (1)

The operating system will make sure that programs can’t access areas of RAM that are for other programs/data (1) this prevents programs/viruses/malware from reading sensitive data / changing how a running program works (1)

[Total 20 marks]