



### 3.4.1 Purposes of an Operating System

#### May/June 2003.P3

9. Describe what happens when a processor which is currently working on a job receives an interrupt from an external source. [6]

#### Oct/NOV 2003

9. (a) Describe the process of spooling when sending jobs for printing. [3]

(b) Explain the importance of job type when a number of jobs are being processed using a multiprogramming operating system. [3]

2. Explain how memory can be managed to allow more than one large job to appear to be stored simultaneously in the memory. [5]

#### May/June 2004.P3

5. (a) Describe the objectives of scheduling in a multi-user operating system. [3]

(b) Describe two common scheduling policies. [4]

(c) State five methods by which the priority of a job may be determined. [5]

#### Oct/NOV 2004.P3

3. Describe how memory is managed in a typical modern computer system. Your answer should include an explanation of

(i) fragmentation of memory, [3]

(ii) paging, [3]

(iii) segmentation, [3]

(iv) virtual memory. [3]

#### Oct/NOV 2005.P3

5. (a) State the purpose of an interrupt in a computer system. [1]

(b) Describe what is meant by a

(i) timer interrupt,

(ii) hardware interrupt. [4]

#### May/June 2006.P3

9. (a) Explain the meaning of the terms;

(i) virtual memory, [2]

(ii) paging memory, [2]

(iii) segmentation of memory. [2]

(b) (i) State what is meant by the term spooling. [2]





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(ii) Describe the process of sending jobs for printing using a spooler. [3]

**Oct/NOV 2006.P3**

9. (a) Explain why the operating system, of a multi-access computer system, needs to schedule the processing of jobs. [2]

(b) Describe how the operating system manages the throughput of jobs. Your answer should contain references to scheduling, job queues and priorities. [5]

**May/June 2007.P3**

1. (b) Describe two of the main components of a typical desktop PC operating system. [4]

**Oct/NOV 2007**

5. (a) State two different types of interrupt and give an example of how each may be generated. [4]

(b) Explain the process carried out by the operating system on receipt of an interrupt. [5]

**May/June 2008**

8. One of the main features of an operating system is the ability to schedule job throughput.

(a) Explain the purpose of scheduling job throughput. [2]

(b) Describe three scheduling policies which lead to different scheduling algorithms. [6]

**Oct/NOV 2008**

6. Explain how memory is managed in a typical modern computer system.

You should use the following as headings for your answer.

(i) Paging [3]

(ii) Segmentation [3]

(iii) Virtual memory [3]

**May/June 2009**

9 Explain how interrupts are dealt with by a processor and how interrupted jobs may later be resumed. [6]

**Oct/NOV 2009. P31**

9. (a) A typical desktop PC operating system is a single-user operating system.

(i) State what is meant by a single-user operating system. [1]

(ii) Describe two components of a typical desktop PC operating system. [4]

**Oct/NOV 2009. P32**

8. Explain how scheduling, job queues and priorities are used to manage job throughput. [6]





### 3.4.1 Purposes of an Operating System

#### May/June 2010. P32

6. (a) Describe the difference between the use of pages and the use of segmentation in managing memory. [2]

(b) A job is split by the operating system into a number of pages. At any one time, only some of the pages are in memory.

Explain how the operating system keeps track of the different pages and the part played by virtual memory in their movement. [6]

#### May/June 2010. P33

6. (a) A job which is being processed is in one of three states: ready, running or blocked.

Explain how the scheduler manages jobs in the processor. [6]

(b) State two types of scheduling algorithm. [2]

#### Oct/NOV 2010. P31

5 (a) Describe two different types of interrupt. [4]

(b) Explain how interrupts are dealt with by a processor and how interrupted jobs may later be resumed. [5]

#### Oct/NOV 2010. P32

5. (a) Describe two different types of interrupt. [4]

(b) Explain how interrupts are dealt with by a processor and how interrupted jobs may later be resumed. [5]

#### Oct/NOV 2010. P33

5. Describe how memory is managed in a typical computer system.

Your answer should include an explanation of

- (i) segmentation,
- (ii) paging,
- (iii) virtual memory. [9]

#### May/June 2011. P31

5 (a) Describe what is meant by the spooling of files. [2]

#### May/June 2011. P32

5. (a) Describe what is meant by the spooling of files. [2]





### 3.4.1 Purposes of an Operating System

#### May/June 2011. P33

5. (a) Describe what is meant by virtual memory. [2]

#### Oct/NOV 2011. P31

1 Describe the following components of a typical PC operating system and explain how they are used.

(a) File allocation table (FAT) [3]

(b) Boot file [3]

6 Explain how interrupts are handled by a computer system. [6]

#### Oct/NOV 2011. P32

1 (a) State what is meant by spooling and why it is used. [2]

(b) A network of computers has a single printer. Each of the computers can send a job for printing at any time.

Explain how a print spooler can be used to control the printing of jobs on the network. [4]

6 Explain how scheduling manages job throughput in a computer. [6]

#### Oct/NOV 2011. P33

1 (a) State what is meant by the boot (bootstrap) program. [2]

(b) Explain how the boot program is used when a PC is turned on. [4]

8 Explain how the following memory management techniques may be used:

(i) Paging [6]

(ii) Segmentation [6]

#### May/June 2012. P31/32

6 In a multiprogramming environment the operating system includes a scheduler.

(a) Explain the purpose of the scheduler. [2]

(b) A process will at any time be in one of three states. [6]

(i) Name and describe each possible state. [6]

(ii) How will the operating system keep details about the state of all processes? [1]

(c) Any process can be described as either 'processor bound' or 'input/output bound'.

(i) Explain what is meant by these terms and give a typical application of each. [4]

Processor bound

Input/Output bound [4]

(ii) A particular scheduler allocates a priority to each process for the use of the processor.

State which type of process – processor bound or I/O bound – would be given higher priority for the use of the processor. Explain why. [2]





### 3.4.1 Purposes of an Operating System

May/June 2012. P33

7 (a) Explain what is meant by an interrupt. [2]

(b) An operating system uses interrupts which have priorities.

Describe the sequence of steps which would be carried out by the interrupt handler software when an interrupt is received and serviced. [6]

(c) Modern personal computer operating systems support multi-tasking.

One of the modules of such an operating system will be for memory management.

Describe two different strategies which could be used to manage the available main memory. [6]

(d) Once a process finishes and memory becomes available, the scheduler will decide which process/job is to be loaded next.

State three attributes of a process which are used to assess which job will be the next to be loaded into main memory. [3]

Oct/NOV 2012. P31

6 The operating system for a computer which supports multiprogramming will have several programs loaded into main memory at any one time. Segmentation is used to manage main memory.

(a) (i) Describe how main memory is managed when a program terminates. [2]

(ii) Describe how the operating system will decide where in main memory to load a new program. [2]

(b) A processor is capable of receiving and handling interrupts. Each interrupt has a priority.

(i) Describe what is meant by an interrupt. [2]

(ii) State two possible sources of an interrupt. Give a reason for each. [4]

(iii) Describe the sequence of steps the processor would carry out after receiving an interrupt. [5]

Oct/NOV 2012. P32

6 (a) Multiprogramming is the ability to have more than one program loaded in the main memory at the same time.

The operating system for a computer which supports multiprogramming must contain a program module for management of the main memory.

Describe two strategies for memory management. [4]

(b) In a multiprogramming computer system, describe two possible strategies for scheduling the use of the processor. [4]





### 3.4.1 Purposes of an Operating System

(c) (i) Describe what is meant by an interrupt. [2]

(ii) State two different sources of an interrupt and give a reason for each interrupt. [4]

**Oct/NOV 2012. P33**

6 The operating system for a computer which supports multiprogramming must manage the allocation of processor time. This is done by the scheduler.

(a) Describe two scheduler strategies for the allocation of processor time amongst the various programs loaded into main memory. [4]

(b) A processor is capable of receiving and handling interrupts. Each interrupt has a priority.

(i) State two possible sources of an interrupt. Give a reason for each. [4]

(ii) Describe the sequence of steps the processor would carry out after receiving an interrupt. [5]

**May/June 2013. P33**

6 (a) Two programs which are regularly run on a computer system are as follows:

PROGRAM X – Monthly payroll where all employee data is entered by the 18th of each month. The payroll program is run on the 25th of the month. Payslips are posted to employees on the 27th of the month.

PROGRAM Y – A kitchen design program is used to produce on-screen layouts for a customer.

State which program is batch processing and which is interactive processing. Use the examples to explain your choice.

Batch processing is PROGRAM

Interactive processing is PROGRAM [4]

(b) A multiprogramming, multi-user operating system organises the available memory into three fixed sized partitions. A program once loaded occupies the same memory locations until its execution is complete.

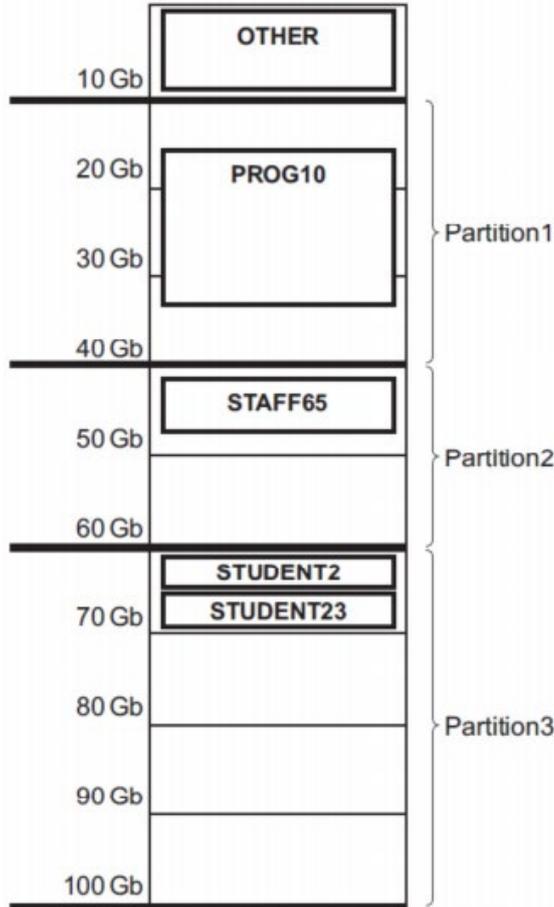
- Partition1 – size 30 Gb – is used only for batch processing
- Partition2 – size 20 Gb – is used for most interactive processing including remote-access users
- Partition3 – size 40 Gb – is used only for interactive sessions in the Computer Laboratory

The diagram shows the current contents of main memory at 08:30 hrs with a list of programs to be loaded.





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- STAFF17 (teacher log-on from a computer in their office – requiring 8 Gb)
  - PROG16 (batch processing – requiring 25 Gb)
- (i) Which jobs (if any) can be loaded? [1]
- (ii) Two students decided to do some work in the Computer Laboratory before their lesson at 09:00 hrs. The 09:00 hrs lesson has 12 students.  
Comment on the size chosen for Partition3. [2]
- (iii) 10 Gb of the main memory is labelled OTHER and will not be used for the execution of application programs.  
Name two possible items of software this memory will be used for. [2]
- (iv) Any program loaded is always in one of three possible states. One is the 'runnable' state meaning the program would like the use of the processor.  
Name and describe the two other states. [4]
- (c) Memory management may also use paging.
- (i) Explain what is meant by paging. [2]
- (ii) Give one benefit of using paging. [1]





### 3.4.1 Purposes of an Operating System

Oct/Nov 2013.P31

6 (a) A PC operating system uses a file allocation table (FAT) to manage its hard disk secondary storage.

- (i) Describe what is meant by a FAT. [2]
- (ii) Explain how the contents of the FAT change when a file is deleted from the hard disk. [2]

(b) (i) The processor receives an interrupt. This triggers the following sequence of steps.

1. Save the contents of the Program Counter on the
2. Also save .....
3. Load and run the appropriate
4. Restore what was saved at step 2
5. Restore the .....
6. Continue execution of the interrupted process

Complete the statements above. [4]

(ii) Interrupts can be allocated priorities.

While execution is occurring at step 3, a higher priority interrupt is received. Explain what additional steps must now be added to the sequence in (b)(i). State where in the sequence these additions occur. [3]

Oct/Nov 2013.P33

6 (a) State where the computer's boot file would be stored.

Explain how the boot file is used to make the computer system ready for use. [3]

(b) (i) Explain what is meant by an interrupt. [1]

(ii) An example of an interrupt generated by a hardware device is the process in which a printer signals that it is out of paper.

Give two further examples of interrupts, one which is hardware generated, and one which is generated by an executing program. [2]

(c) In a multiprogramming environment several processes are concurrently loaded into main memory. Each process is in one of three states: RUNNING, READY, SUSPENDED. [3]





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Oct/Nov 2014.P31/P33

2 (a) Modern operating systems use a memory management technique called paging. Explain how paging works by using the terms:

- Page
- Page frame
- Page table

[3]

(b) For a computer system using multi-programming, the low-level scheduler decides what process will get next use of the processor.

One algorithm could be a “round-robin”; that is, every process gets use of the processor in sequence.

State two other algorithms which could be used by the low-level scheduler.

[2]

(c) For a “round-robin” algorithm, five processes are currently loaded and get the use of the processor in the sequence:

PROG16 – PROGWP – PROGDB – PROG11 – PROG31, then return to PROG16

Process PROGDB has just completed its time-slice.

Put the sequence of events below in the correct order.

Note: two of the statements will not be used.

A	Process PROG11
B	Interrupt received from the low-level scheduler
C	Copy to the CPU registers the contents of the file directory for PROG11
D	Save the PC and all other registers contents for PROGDB to its Process Control Block (PCB)
E	Copy to the CPU registers the contents of the stack
F	Copy to the CPU registers the contents of the Process Control Block for PROG11

List the sequence of events using the letters.

[4]

Oct/Nov 2014.P32

2 Modern operating systems use paging for memory management.

(a) An invoicing program is being executed. Some of the pages are stored in main memory. The user selects a print operation. This operation requires a program instruction that is not contained in any of the loaded pages.

Explain how paging deals with this situation.

[3]





### 3.4.1 Purposes of an Operating System

(b) For a computer system using multi-programming, the low-level scheduler will decide what process will get next use of the processor.

(i) One algorithm could be “give the processor to the process which was given the highest priority”. Describe two other strategies which could be used by the low-level scheduler. [2]

(ii) The computer system runs processes which can be described as either:

- ‘processor-bound’, or
- ‘input/output bound’

Explain each term and give an example. [4]

(c) A computer system uses interrupts to deal with signals received from a peripheral device such as a printer. The processor is processing Task X when an interrupt is received from Printer P.

The following statements describe how the interrupt is handled:

Label	Step
A	Restore the Program Counter
B	Load and run the appropriate Interrupt Service Routine (ISR)
C	Save the contents of the program counter on the stack
D	Restore all other registers
E	Identify the source and type of the interrupt signal
F	Save contents of all other registers
G	Continue execution of Task X

Complete the sequence of steps using the letters. The final step, G, has been placed for you.

G

[4]





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Oct/Nov 2015.P31/P33

7 The diagram shows the main memory contents of a computer system. It is controlled by a multiprogramming operating system.

	Operating System
	A
	B
Partition 1	PROG2
	PROG7
	PROG16
	Unused
Partition 2	USER21
	USER34
	USER46
	Unused

(a) Define the term multi-programming. [1]

The main memory is divided into two partitions. Partition 1 is dedicated to batch processing. The diagram shows:

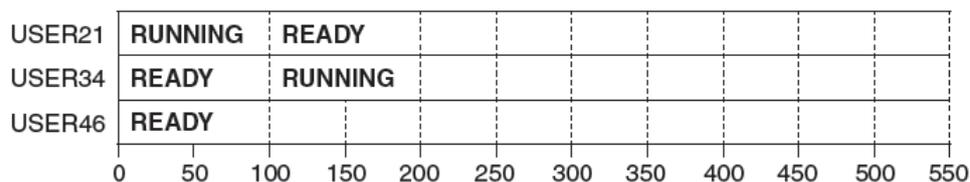
- the operating system
- systems software (A and B)
- three batch programs (in Partition 1)

(b) Suggest **two** items of systems software (A and B) that are currently loaded in main memory. [2]

(c) Describe **three** characteristics of batch processing. [3]

(d) Partition 2 of the main memory is used for interactive programs. The low-level scheduler operates a round-robin strategy. It allocates a time slice of 100 milliseconds.

- (i) Explain what is meant by the term 'round-robin'. [2]
- (ii) The program USER21 starts its time slice at time zero. The scheduler puts programs that are ready into the RUNNING state in the same order as the rows in the following diagram.





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- During its first time slice, USER46 becomes suspended after 50 ms.
- USER46 is changed to the ready state 100 ms after its suspension.

Label the diagram to show how the state of each program changes for the first 500 ms.

You should use the labels RUNNING, READY and SUSPENDED. When necessary, you may abbreviate any of these to its first three letters.

- (iii) State what could have caused USER46 to become suspended.

[5]

[1]





### 3.4.1 Purposes of an Operating System

#### Computer Science (9608)

Oct/Nov 2015.P31/P33

6 A number of processes are being executed in a computer.

(a) Explain the difference between a program and a process. [2]

A process can be in one of three states: running, ready or blocked.

(b) For each of the following, the process is moved from the first state to the second state.

Describe the conditions that cause each of the following changes of the state of a process:

From running to ready

From ready to running

From running to blocked [6]

(c) Explain why a process cannot be moved from the blocked state to the running state. [3]

(d) Explain the role of the high-level scheduler in a multiprogramming operating system. [2]

Oct/Nov 2015.P32

6 A number of processes are being executed in a computer.

A process can be in one of three states: running, ready or blocked.

(a) For each of the following, the process is moved from the first state to the second state.

Describe the conditions that cause each of the following changes of state of a process:

From blocked to ready

From running to ready [4]

(b) Explain why a process cannot move directly from the ready state to the blocked state. [3]

(c) A process in the running state can change its state to something which is neither the ready state nor the blocked state.

(i) Name this state. [1]

(ii) Identify when a process would enter this state. [1]

(d) Explain the role of the low-level scheduler in a multiprogramming operating system. [2]

