Cambridge International A Level

Cambridge International Examinations
Cambridge International Advanced Level

COMPUTER SCIENCE **9608/31**

Paper 3 Written Paper **May/June 2016**

MARK SCHEME

Maximum Mark: 75

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

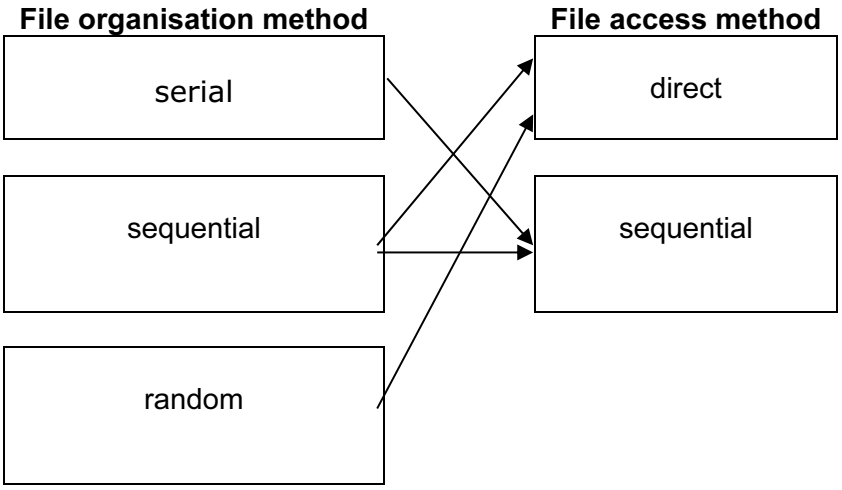
Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1 (a)</td><td>Single line joining all four computers and file server
One “terminator” at each end</td><td>1
1</td></tr>
<tr><td>(b)</td><td><table><tr><th>Statement</th><th>True</th><th>False</th></tr><tr><td>Computer C uses the IP address of Computer A to indicate that the packet is for Computer A.</td><td>✓</td><td></td></tr><tr><td>Computer B can read the packet sent from Computer C to Computer A.</td><td>✓</td><td></td></tr><tr><td>The File server routes the packet to Computer A.</td><td></td><td>✓</td></tr></table></td><td>1
1
1</td></tr>
<tr><td>(c) (i)</td><td>Collision</td><td>1</td></tr>
<tr><td>(ii)</td><td>Both stop transmitting
Each uses a random time
Wait for time period
Check for bus status
Attempt to re-transmit</td><td>1
1
1
1
1
Max 3</td></tr>
<tr><td>(d)</td><td>Star topology created
A switch has a number of ports
Each connects to a single device (using a dedicated cable)
Switch provides direct transmission/path from device to device
Collisions are no longer possible
There are dedicated links from Computer A to Computer C AND from the Server to Computer D</td><td>1
1
1
1
1
1
Max 4</td></tr>
<tr><td>2 (a)</td><td>Examples:
Serial number
Certificate Authority that issued certificate
CA digital signature
Name of company/organisation/individual/subject/owner owning Certificate
‘Subject’ public key
Period during which Certificate is valid // some relevant date</td><td>A mark for each correct data item –
Max 3</td></tr>
<tr><td>(b) (i)</td><td>Public
The individual keeps their private key private // the public key can be known by others (the public)</td><td>1
1</td></tr>
<tr><td>(ii)</td><td>Public
The individual does not know the private key of the CA // the individual only knows the public key of the CA // only the CA can decrypt the packaged information</td><td>1
1</td></tr>
</table>

(iii)	Private 'Only' the CA's public key will allow decryption of the Certificate // proving the certificate was issued by the CA	**1** **1**
(c) (i)	Digital signature	**1**
(ii)	Alexa's digital certificate (Includes) Alexa's public key Used to hash message received // produce message digest Generated hash compared to digital signature	**1** **1** **1** **1** **Max 2**
(iii)	Examples: Financial transaction Legal document Software distribution	 **1** **1** **1** **Max 2**
3 (a) (i)	Examples: Create / delete virtual machine Existing hardware made available to guest OS // hardware emulation Ensures each virtual machine is protected from actions of another virtual machine	 **1** **1** **1** **Max 2**
(ii)	Guest operating system: An operating system running in a virtual machine // Controls virtual hardware // OS is being emulated Host operating system: The operating system that is actually controlling the physical hardware // the operating system for the physical machine// the OS running the VM software Guest OS is running under the Host OS software	 **1** **1** **1** **Max 2**
(b) (i)	Examples: Trial/use alternative replacement operating system(s) … Test to identify possible problems Much easier to create VM with a new OS than create new computer system Trial/use alternative replacement web server software … Test to identify possible problems Easier to try alternative new software <u>and</u> new OS combinations To provide some additional service(s) Trial/test its use - description e.g. a print server General description point – to provide a safe environment during testing (which does not disrupt the web server service)	 **Two marks for each use** **Maximum two uses** **Max 4**

(ii)	Examples: Using virtual machine means execution of extra code // emulation of some hardware … Non-VM installation may not perform in the same way Execution speed slower than non-VM system Problems in judging actual response times at time of maximum traffic needs fastest possible speed Particular hardware may be difficult to emulate	**1** **1** **1** **1** **1** **1** **Max 2**
4 (a)		**1** **2** **1**
(b) (i)	Sequential As all customers get statement … // high hit rate Suitable for batch processing of the records // the records will be processed one after the other File organised using customer's unique ID (as primary key field) // Serial As all customers get statement … // high hit rate Suitable for batch processing of the records // the records will be processed one after the other Order not important	**1** **1** **1** **1** **1** **1** **1** **1** **Max 3**
(ii)	Random Real-time transaction processing Requires fastest access to data No need to search through records	**1** **1** **1** **1** **Max 3**

(iii)	Serial Each new record is appended Transactions are recorded in chronological order File re-organisation not required for each new record // no need for the records to be sorted	**1** **1** **1** **Max 3**
5 (a)	<table><tr><th>A</th><th>B</th><th>X</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>	**1**
(b) (i)	<table><tr><th>S</th><th>R</th><th>Q</th><th>$\overline{Q}$</th></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr></table>	**1** **1** **1** **1**
(ii)	S = 0 R = 0 Produces Q = 1 , $\overline{Q}$ =1 // Q and $\overline{Q}$ have same value But Q and $\overline{Q}$ should be complements of each other Becomes unstable	**1** **1** **1** **1** **Max 3**
(c) (i)	Clock (pulse)	**1**
(ii)	All four possibilities are valid The 1-1 combination changes output to logical complement Unstable state avoided Invalid state cannot occur // the flip-flop is stable	**1** **1** **1** **1** **Max 1**
(d)	Memory // data storage Stores a single bit	**1** **1**
6 (a) (i)	Monitoring system	**1**
(ii)	This is not a 'feedback' system // There is no 'control' taking place/use of actuators // No output other than from alarm	**1**

(b)

Examples:
Pressure …
If intruder steps on sensor

Infra-red …
If beam cut by intruder

Motion / ultrasonic…
Detects any **movement** in an area

Contact / magnetic …
If door / window opened

1 – sensor
1 – justification

Maximum 2 sensors

Max 4

(c) (i)

BITREG	COUNT	VALUE	ACC
B00001010	0	1	B00001010
			B00000000
			1
		2	2
			B00001010
			B00000010
			0
	1		1
			2
		4	4
			B00001010
			B00000000
			4
		8	8
			B00001010
			B00001000
			1
	2		2
			8

Mark as follows:

1 mark for:

COUNT column

VALUE column

First two values in ACC column

Rest of ACC column

Max 4

(ii) #1 — **1**

(iii) CMP #8 — **1**

CMP #128 — **1**