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

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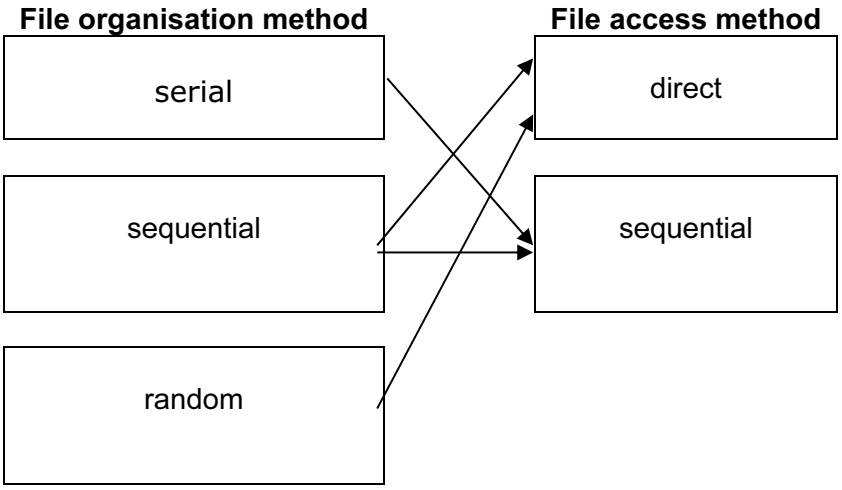
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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1 (a)</td><td>Single line joining all four computers and file server
One “terminator” at each end</td><td>1
1</td></tr>
<tr><td>(b)</td><td><table><tr><th>Statement</th><th>True</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>

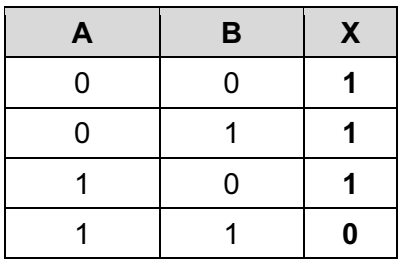
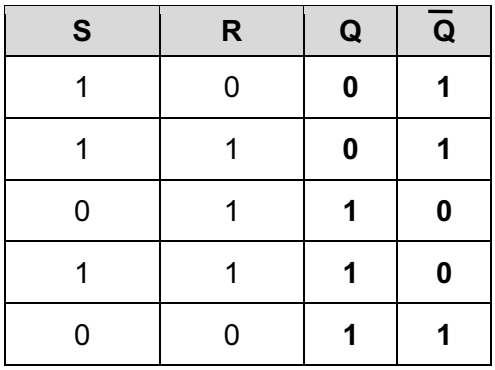
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(iii)	Private 'Only' the CA's public key will allow decryption of the Certificate // proving the certificate was issued by the CA	**1** **1**
(c) (i)	Digital signature	**1**
(ii)	Alexa's digital certificate (Includes) Alexa's public key Used to hash 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**

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(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**

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(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)	 **A** **B** **X** 0 0 **1** 0 1 **1** 1 0 **1** 1 1 **0**	**1**
(b) (i)	 **S** **R** **Q** $\overline{Q}$ 1 0 **0** **1** 1 1 **0** **1** 0 1 **1** **0** 1 1 **1** **0** 0 0 **1** **1**	**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**

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(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**

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