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Cambridge International Examinations
Cambridge International Advanced Level

COMPUTER SCIENCE

9608/32

Paper 3 Written Paper

May/June 2016

MARK SCHEME

Maximum Mark: 75

Published

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[Turn over

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Question	Answer	Marks												
1 (a)	Single line joining all four computers and file server One “terminator” at each end	1 1												
(b)	<table border="1"> <thead> <tr> <th>Statement</th><th>True</th><th>False</th></tr> </thead> <tbody> <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> </tbody> </table>	Statement	True	False	Computer C uses the IP address of Computer A to indicate that the packet is for Computer A.	✓		Computer B can read the packet sent from Computer C to Computer A.	✓		The File server routes the packet to Computer A.		✓	1 1 1
Statement	True	False												
Computer C uses the IP address of Computer A to indicate that the packet is for Computer A.	✓													
Computer B can read the packet sent from Computer C to Computer A.	✓													
The File server routes the packet to Computer A.		✓												
(c) (i)	Collision	1												
(ii)	Both stop transmitting Each uses a random time Wait for time period Check for bus status Attempt to re-transmit	1 1 1 1 1 Max 3												
(d)	Star topology created A switch has a number of <u>ports</u> 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	1 1 1 1 1 1 Max 4												
2 (a)	Examples: Serial number Certificate Authority that issued certificate <u>CA</u> digital signature Name of company/organisation/individual/subject/owner owning Certificate <u>‘Subject’</u> public key Period during which Certificate is valid // some relevant date	A mark for each correct data item – Max 3												
(b) (i)	Public The individual keeps their private key private // the public key can be known by others (the public)	1 1												
(ii)	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	1 1												

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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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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 Max 2
	(a)	File organisation method serial direct sequential sequential random	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 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)	<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>	A	B	X	0	0	1	0	1	1	1	0	1	1	1	0	1									
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(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>	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
S	R	Q	$\overline{Q}$																							
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1	1	1	0																							
0	0	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)	<table><tr><th>BITREG</th><th>COUNT</th><th>VALUE</th><th>ACC</th></tr><tr><td>B00001010</td><td>0</td><td>1</td><td>B00001010</td></tr><tr><td></td><td></td><td></td><td>B00000000</td></tr><tr><td></td><td></td><td></td><td>1</td></tr><tr><td></td><td></td><td>2</td><td>2</td></tr><tr><td></td><td></td><td></td><td>B00001010</td></tr><tr><td></td><td></td><td></td><td>B00000010</td></tr><tr><td></td><td></td><td></td><td>0</td></tr><tr><td></td><td>1</td><td></td><td>1</td></tr><tr><td></td><td></td><td></td><td>2</td></tr><tr><td></td><td></td><td>4</td><td>4</td></tr><tr><td></td><td></td><td></td><td>B00001010</td></tr><tr><td></td><td></td><td></td><td>B00000000</td></tr><tr><td></td><td></td><td></td><td>4</td></tr><tr><td></td><td></td><td>8</td><td>8</td></tr><tr><td></td><td></td><td></td><td>B00001010</td></tr><tr><td></td><td></td><td></td><td>B00001000</td></tr><tr><td></td><td></td><td></td><td>1</td></tr><tr><td></td><td>2</td><td></td><td>2</td></tr><tr><td></td><td></td><td></td><td>8</td></tr></table>	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
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