

QUESTION 1.



9 (a) Any **one** from:

- (ShopSales) table has repeated group (of attributes)
- each sales person has a number of products
- FirstName, Shop would need to be repeated for each record

(b) **One mark** for SalesPerson table

table: SalesPerson

FirstName	Shop
Nick	TX
Sean	BH
John	TX



table: SalesProducts

FirstName	ProductName	NoOfProducts	Manufacture
Nick	television set	3	SKC
Nick	refrigerator	2	WP
Nick	digital camera	6	HKC
Sean	hair dryer	1	WG
Sean	electric shaver	8	BG
John	television set	2	SKC
John	mobile phone	8	ARC
John	digital camera	4	HKC
John	toaster	3	GK

(1 mark for FirstName column + 1 mark for remainder of table)

[3]

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	Cambridge International AS/A Level – May/June 2015	



(c) (i) Any **two** from:

- primary key of SalesPerson table is FirstName
- links to FirstName in SalesProducts table
- FirstName in SalesProductsS table is foreign key

(ii) • There is a non-key dependency
 • Manufacturer is dependent on ProductName, (which is not the primary key of the SalesProducts table)

[2]

(iii) SalesPerson (FirstName, Shop)
 -SalesProducts (FirstName, ProductName, NoOfProducts) **OR**
 SalesProducts (SalesID, FirstName, ProductName, NoOfProducts)

-Product (ProductName, Manufacturer)

1 mark for correct attributes in SalesProducts and Product tables and **1 mark** for correct identification of both primary keys

[2]

QUESTION 2.



7 (a) (i)

Accumulator:

0	1	1	1	0	1	0	1
---	---	---	---	---	---	---	---

 [1]

(ii)

Accumulator:

0	1	1	0	1	0	0	1
---	---	---	---	---	---	---	---

 [1]

explanation

- content of 124 is 0 1 1 1 1 1 1 1
- this is equivalent to 127
- contents of 127 are 0 1 1 0 1 0 0 1

[2]

(iii)

Accumulator:

0	1	0	0	0	0	0	1
---	---	---	---	---	---	---	---

 [1]

explanation

- index register value = 6
- $120 + 6 = 126$
- contents of 126 placed in the accumulator

[2]



(b) 1 mark for each correct value in the table.

Accumulator	Memory address			
	320	321	322	323
	49	36	0	0
36				
37				
				37
49				
50				
			50	

[6]

QUESTION 3.

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level



MARK SCHEME for the October/November 2015 series

9608 COMPUTER SCIENCE

9608/11

Paper 1 (Written Paper), maximum raw mark 75

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 October/November 2015 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

Page 2	Mark Scheme
	Cambridge International AS/A Level – October/November 2015



1 (a) any **two** from:

- sequence of digital signals / bits
- over a communication path / Internet
- transfer of data at high speed
- requires fast broadband connection
- requires some form of buffering
- bits arrive in the same order as sent

[2]

(b) (i) any **two** from:

- no need to wait for a whole file to be downloaded
- no need to store large files on user's computer
- allows on demand playback
- no specialist software is required for playback in browser

[2]

(ii) any **two** from:

- video stops / hangs if very slow Internet / broadband speed low
- video stops / hangs if inadequate buffering capacity
- loss of Internet means can't access films / files
- may require specific software to run the files / films
- viruses can be downloaded from the websites

[2]

(c) 2 marks for on-demand and 2 marks for real-time

on-demand

- digital video tape, analogue video tape, or digital files are converted to bit streaming – format for broadcasting on the net; this is known as encoding, these encoded streaming video files are then uploaded to a dedicated server
- a link for the encoded video is placed on a web site
- a user clicks on the link to download the encoded streaming video; the streamed video is then broadcast to the user as and when they require it
- can be paused / can go back and re-watch / fast-forward, etc.

real-time

- an event is captured live with a video camera
- the video camera is connected to a computer
- the video signal is converted to streaming media files (encoded) on the computer
- the encoded feed is then uploaded from the computer to a dedicated streaming server via cable, DSL, or a high-speed internet connection
- the server then sends the live images it to all users requesting it as real-time video streaming
- cannot be paused etc.

[4]



2 (a) A = control bus

B = address bus

C = data bus

(b) Program Counter – stores the address of next instruction to be executed

Memory Data Register – stores the data in transit between memory and other registers // holds the instruction before it is passed to the CIR

Current Instruction Register – stores the current instruction being executed

Memory Address Register – stores the address of the memory location which is about to be accessed [4]

3 (a)

Statement	True (✓)
The IP address consists of any number of digits separated by single dots (.)	
Each number in an IP address can range from 0 to 255	✓
IP addresses are used to ensure that messages and data reach their correct destinations	✓
Public IP addresses are considered to be more secure than private IP addresses	

accept words TRUE or FALSE in right hand column

1 mark per tick, –1 mark for each wrong tick if more than 2

[2]

(b) (i) http – enables browser to know what protocol is being used to access information in the domain

cie.org.uk – cie.org.uk is the domain name

computerscience.html – actual web page / file being viewed

[3]

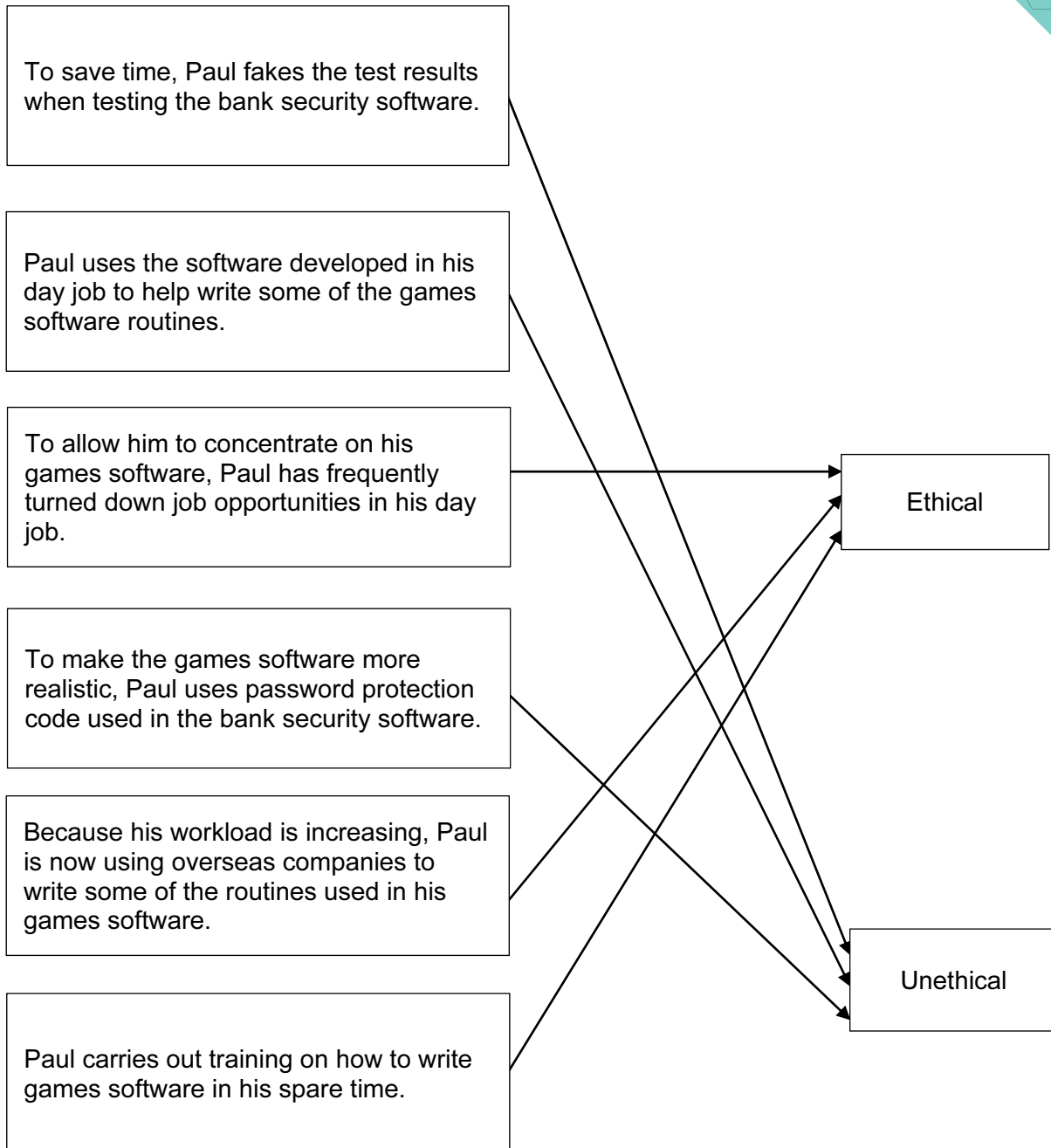
(ii) %20 – because <space> not allowed in a URL, %20 is the coding for a space (32 in denary)

? – separates the URL from all parameters or variables

[2]



4



1 mark for each correct line, two lines from one box is incorrect

[6]



- 5 (i) any **four** from:
- sensors send signals / data to a computer
 - data / signal converted to digital (using an ADC)
 - computer calculates the activity value based on sensor signal strength / data
 - if calculated value > 3,
 - determine location of sensor
 - build up a map of seismic activity
 - location and magnitude sent to printer
 - ... via USB port / wireless link
 - monitoring is continuous [4]
- (ii) – output / hard copy not picked up in good time [1]
- (iii) 1 mark for name + 1 mark for reason for choice
- speaker / buzzer / alarm bell
 - gives control room operators an audible warning
 - flashing lights
 - gives control room operators an visual warning
 - monitor
 - use of red / flashing colours on monitor gets the attention of operators [2]
- 6 any **four** points from (maximum 3 marks per type of cable):
- fibre optic cables have greater bandwidth
 - fibre optic cables need less signal boosting // can transmit over longer distances
 - fibre optic cables have greater security (more difficult to “tap” into)
 - fibre optic cables are immune to electromagnetic and other effects
 - fibre optic cabling is lighter in weight (easier to install)
 - fibre optic cables consume less power
 - copper cabling is less expensive to install
 - copper cable is easier to install because it is more flexible
 - it is easier to make terminations using copper cabling
 - the expertise in use of copper cabling is more extensive
 - has been around for years ... so very little is “unknown” about installations using this type of cabling [4]



- 7 (a) (i) – at least one computer used to “serve” ...
 – ... other computers are referred to as “clients”
 – server provides services / applications etc. ...
 – ... which may be requested by clients
- (ii) any **two** from:
- files and resources are centralised
 - creation of security / manage security
 - user needs user name and password to access network
 - centralised back-up
 - intranet capability
 - Internet monitoring
 - clients can be less powerful machines, therefore less expensive to buy
 - saving resources on server reduces the burden on the client
- [2]

(b) router [1]

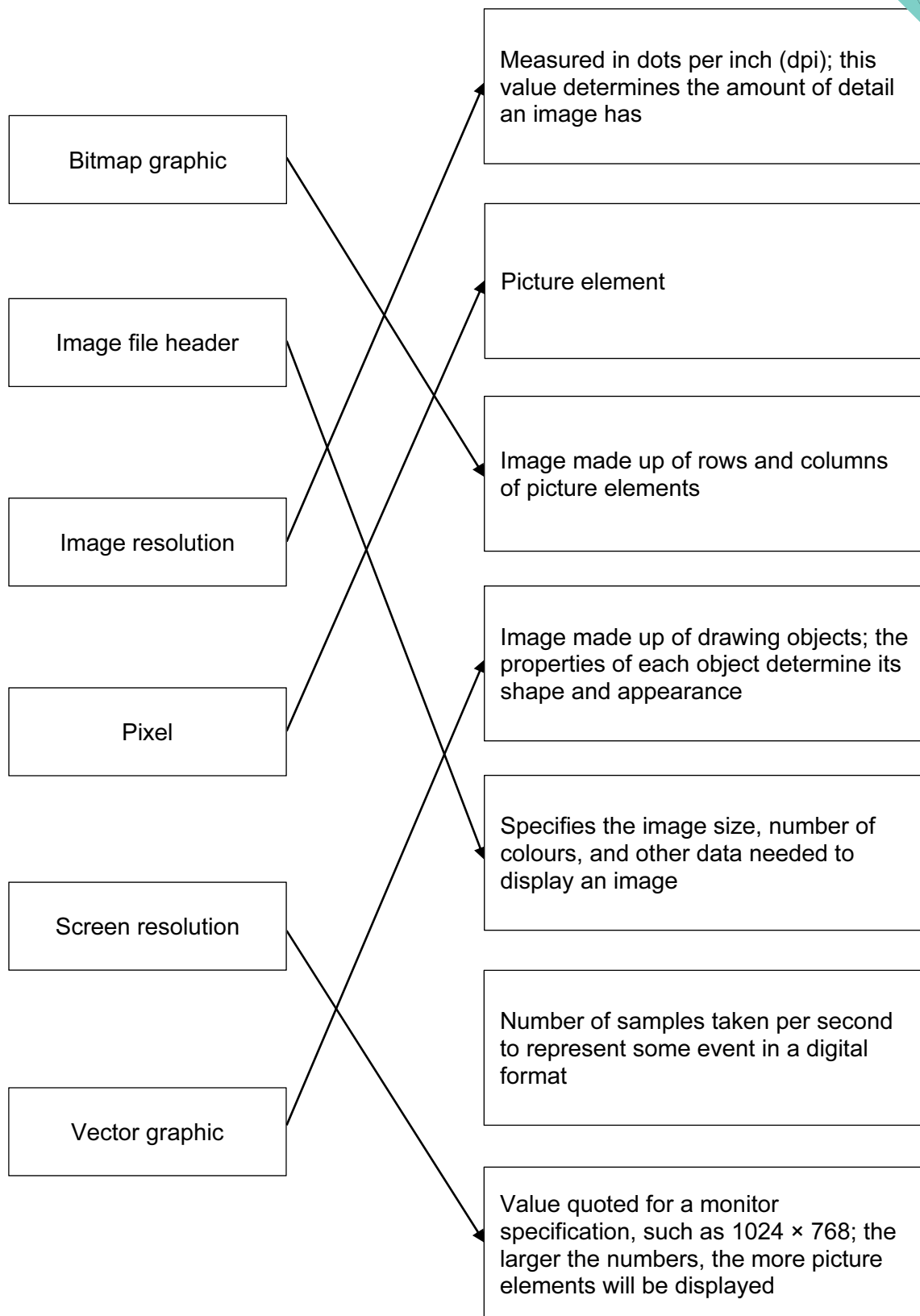
(c)

Statement	Sequence number
The requested web page is displayed on the client computer	5
The user clicks on the hyperlink and the web page is requested from the web server	1
The requested web page content is transmitted to the client computer	3
The client computer processes the JavaScript code using the web browser software	4
The web server locates the requested web page	2

[5]



8 (a)



1 mark for each correct line, two lines from one box is incorrect

[6]



(b) (i) $\frac{512 \times 256}{8 \times 1024} = 16 \text{ KB}$

1 mark for numerator + 1 mark for denominator

- (ii) so it is possible to estimate how many images can be stored / to decide if it can be sent as an email attachment [1]

9 (a) One mark for validation, one mark for verification.

validation

- check whether data is reasonable / meets given criteria

verification

- method to ensure data which is copied / transferred is the same as the original
- entering data twice and computer checks both sets of data
- check entered data against original document / source

[2]

(b) any **four** from:

- parity can be even or odd
- parity check uses the number of 1s in a binary pattern
- if there is an even / odd number of 1s, then the parity is even / odd
- following transmission ...
- parity of each byte checked
- a parity bit is used to make sure binary pattern has correct parity
- example: 1 0 0 1 0 1 1 1 has parity bit set to 1 in MSB since system uses odd parity (original data: 0 0 1 0 1 1 1 which has four 1 bits)

[4]

10 (a) any **two** from:

- malicious code / software / program
- that replicates / copies itself
- can cause loss of data / corruption of data on the computer
- can cause computer to “crash” / run slowly
- can fill up hard disk with data

[2]

(b) any **two** from:

- checks for boot sector viruses when machine is first turned on
- when an external storage device is connected
- checks a file / web page when it is accessed / downloaded

[2]



11

Statement	Interpreter	Correct
This translator creates an executable file		✓
When this translator encounters a syntax error, game execution will halt	✓	
The translator analyses and checks each line just before executing it	✓	
This translator will produce faster execution of the game program		✓
Use of this translator makes it more difficult for the user to modify the code of the game supplied to the user		✓

1 mark for each correct row

[5]

QUESTION 4.



9 (a) (i) **One mark** for the contents of the accumulator and **one mark** for the reason. [2]

Accumulator contents: 0100 0101

Reason:

Address is 60

Contents of the index register is 8

And $60 + 8 = 68$ in denary gives the address

The contents of which is 0100 0101 in binary.

(ii) **0000 0111** [1]



(b)

Instruction address	Working space	ACC	Memory address				IX	C
			100	101	102	103		
			20	100	1	0	1	
50		20						
51		21						
52						21		
53		100						
54		120						
55								
56								
57								
59							2	
60		20						
61		120						
62								'x'
63								

One mark for each shaded block.

[7]

- Contents of the Accumulator in first 2 lines (instruction addresses 50 and 51)
- Updating address 103 (instruction 52)
- Loading the Accumulator and addition (instructions 53 and 54)
- Not executing instruction 58
- Incrementing the index register (instruction 59)
- Loading the Accumulator and addition (instructions 60 and 61)
- Correct output of 'x' (instruction 62)

QUESTION 5.



7 (a) Four from:

[4]

- Security is keeping the data safe.
- Integrity is making sure that the data is correct / valid.
- Security is the prevention of data loss.
- Integrity ensures that the data received is the same as the data sent / data copied is the same as the original.
- Example of ensuring security, e.g. usernames and passwords, firewalls etc...
- Example of ensuring integrity, e.g. parity checks, double entry etc...

(b) Three pairs from:

[6]

- Installing a firewall and ensuring it is switched on.
- To stop unauthorised access / hackers gaining access to the bank's computer network.
- Use authentication methods such as passwords and usernames.
- Passwords should be strong / biometrics.
- Encrypt the data.
- So that if data is accessed it will be meaningless / only accessed by those with decryption key.
- Set up access rights...
- To stop users reading/editing data they are not permitted to access.
- Installing and running an up to date anti-malware program (anti-virus/anti-spyware etc.).
- To detect / remove / quarantine viruses / key-loggers etc.
- Make regular backups of the data.
- To separate device or off site to enable recovery if necessary.
- Employ measures for physical security.
- Example of a measure for physical security.

QUESTION 6.



8 (a) (i)

Accumulator:	1	0	0	1	0	1	1	1
--------------	---	---	---	---	---	---	---	---

[1]

(ii) **One mark** for answer and **two marks** for explanation

Accumulator:	1	1	0	0	0	0	1	0
--------------	---	---	---	---	---	---	---	---

- Index Register contains $1001 = 9$
- $800 + 9 = 809$

[3]

(b) (i) **ONE** mark for each correct row.

ACC	Memory address				OUTPUT
	800	801	802	803	
	40	50	0	90	
40					
90			90		
90			90		
					Z

[4]

(ii) 107

[1]

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	Cambridge International AS/A Level – October/November 2016



(c) (i) Any **two** from:

- Only 128 / 256 characters can be represented
- Uses values 0 to 127 (or 255 if extended form) / one byte
- Many characters used in other languages cannot be represented
- In extended ASCII the characters from 128 to 255 may be coded differently in different systems

[2]

(ii) Any **two** from:

- Uses 16, 24 or 32 bits / two, three or four bytes
- Unicode is designed to be a superset of ASCII
- Designed so that most characters (in other languages) can be represented

[2]

QUESTION 7.

Cambridge International AS/A Level – October/November 2016



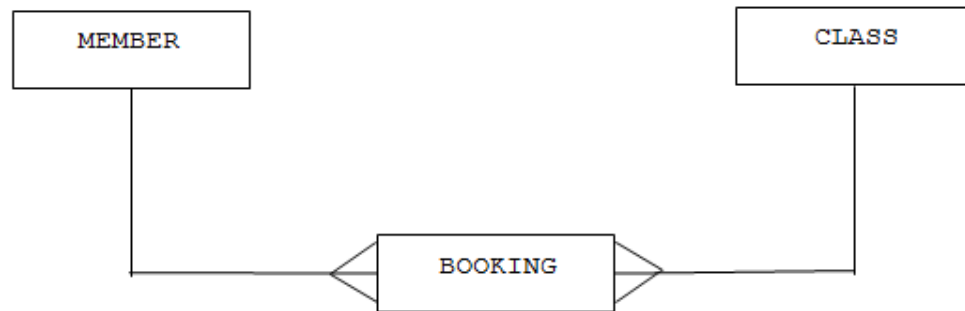
9 (a) **ONE** mark for each reason and **ONE** mark for a further explanation. **MAX THREE**

- Reduced data redundancy / data duplication
- Data is stored in (separate) linked tables
- The database (generally) stores data only once / data need only be updated once
- Improved data consistency / integrity / associated data will be automatically updated / easier to maintain the data / elimination of unproductive maintenance
- Complex queries can be more easily written
- To search / find specific data // specific example related to the Health Club
- Fields can be more easily added to or removed from tables
- Without affecting existing applications (that do not use these fields)
- Program-data dependence is overcome
- Changes to the data (design) do not require changes to programs // changes to programs do not require changes to data // the data can be accessed by any appropriate program
- Security is improved
- Each application only has access to the fields it needs // different users can be given different access rights
- Different users can be given different views of the data / data privacy is maintained
- So they do not see confidential information
- Allows concurrent access
- Record locking prevents two users updating the same record at the same time // record locking assures data consistency

[6]



(b) **ONE** mark for each correct relationship as shown.



[2]

(c) An example of a script is shown, but different syntax may be used.

```

CREATE TABLE CLASS (
    ClassID VARCHAR(5),
    Description VARCHAR(30),
    StartDate DATE,
    ClassTime TIME,
    NoOfSessions INT,
    AdultsOnly BIT,
    PRIMARY KEY(ClassID)
);
  
```

Mark as follows:

- 1 mark** for CREATE TABLE CLASS and ();
- 1 mark** for PRIMARY KEY(ClassID)
- 1 mark** for both ClassID VARCHAR(5), and Description VARCHAR(30),
- 1 mark** for both StartDate DATE, and ClassTime TIME,
- 1 mark** for NoOfSessions INT,
- 1 mark** for AdultsOnly BIT,

[6]

QUESTION 8.

Cambridge
International
AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level



COMPUTER SCIENCE

9608/11

Paper 1 Written Paper

May/June 2017

MARK SCHEME

Maximum Mark: 75

Published

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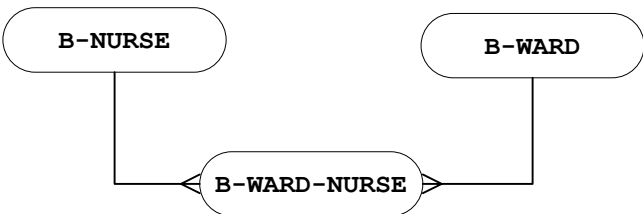
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This document consists of **8** printed pages.



Question	Answer		
1(a)	Many-to-one		
1(b)(i)	A-NURSE (<u>NurseID</u> , FirstName, FamilyName, WardName)		
1(b)(ii)	- The primary key <u>WardName</u> in the A-WARD table links to the foreign key <u>WardName</u> in the A-NURSE table.	1 1	
1(c)(i)	Many-to-many relationship		1
1(c)(ii)	B-WARD-NURSE (<u>WardName</u> , <u>NurseID</u>) Both attributes (with no additions) Joint primary key correctly underlined	1 1	2
1(c)(iii)	 Correct relationship between B-NURSE and B-WARD-NURSE Correct relationship between B-WARD and B-WARD-NURSE	1 1	2
1(d)(i)	SELECT NurseID, FamilyName FROM B-NURSE WHERE Specialism = 'THEATRE';	1 1 1	3
1(d)(ii)	UPDATE B-NURSE SET FamilyName = 'Chi' WHERE NurseID = '076';	1 1 1	3



Question	Answer															
2(a)(i)	<table><tr><td>1</td><td>A laser beam and a rotating mirror are used to draw an image of the page on the photosensitive drum.</td></tr><tr><td>2</td><td>C // The image is converted on the drum into an electrostatic charge.</td></tr><tr><td>3</td><td>Electrostatic charge attracts toner.</td></tr><tr><td>4</td><td>The charged paper is rolled against the drum.</td></tr><tr><td>5</td><td>D // The oppositely-charged paper picks up the toner particles from the drum. After picking up the toner, the paper is discharged to stop it clinging to the drum.</td></tr><tr><td>6</td><td>A // The paper passes through a fuser, which heats up the paper. The toner melts and forms a permanent image on the paper.</td></tr><tr><td>7</td><td>B // The electrical charge is removed from the drum and the excess toner is collected.</td></tr></table> C in the correct place 1 DA, 1 AB 1	1	A laser beam and a rotating mirror are used to draw an image of the page on the photosensitive drum.	2	C // The image is converted on the drum into an electrostatic charge.	3	Electrostatic charge attracts toner.	4	The charged paper is rolled against the drum.	5	D // The oppositely-charged paper picks up the toner particles from the drum. After picking up the toner, the paper is discharged to stop it clinging to the drum.	6	A // The paper passes through a fuser, which heats up the paper. The toner melts and forms a permanent image on the paper.	7	B // The electrical charge is removed from the drum and the excess toner is collected.	
1	A laser beam and a rotating mirror are used to draw an image of the page on the photosensitive drum.															
2	C // The image is converted on the drum into an electrostatic charge.															
3	Electrostatic charge attracts toner.															
4	The charged paper is rolled against the drum.															
5	D // The oppositely-charged paper picks up the toner particles from the drum. After picking up the toner, the paper is discharged to stop it clinging to the drum.															
6	A // The paper passes through a fuser, which heats up the paper. The toner melts and forms a permanent image on the paper.															
7	B // The electrical charge is removed from the drum and the excess toner is collected.															
2(a)(ii)	Inkjet printer	1														
2(b)	Hard disk drive // HDD 1 Solid state drive //SSD // flash memory 1 One from: <i>Hard disk</i> Inexpensive per unit of storage 1 <u>Larger</u> storage capacity than flash drive 1 <i>Solid state storage</i> No moving parts / noise 1 Robust 1 Low latency // Fast read/write time 1	3														



Question	Answer	
3(a)	Sampling rate The <u>number of samples</u> taken <u>per unit time</u> // the number of times the amplitude is measured <u>per unit time</u> Increasing the sampling rate will increase the accuracy / precision of the digitised sound // Increasing the sampling rate will result in smaller quantisation errors.	1 1
3(b)(i)	Pixel Smallest picture element which can be drawn Screen resolution The number of pixels which can be viewed horizontally and vertically on the screen // or by example - A typical screen resolution is 1680 pixels × 1080 pixels.	1 1
3(b)(ii)	8	1
3(b)(iii)	Working: Max <u>two</u> from: - Number of pixels is 2048×512 - One pixel will be stored as one byte - Number of kilobytes = $(2048 \times 512) / 1024$ Answer: <u>One</u> mark: Number of kilobytes = 1024 KB	1 1 1 1
3(b)(iv)	<u>One</u> from: - Confirmation that the file is a BMP - File size - Location/offset of image data within the file - Dimensions of the image in pixels // image resolution - Colour depth (bits per pixel) - Type of compression used, if any	1 1 1 1 1 1



Question	Answer	
4(a)(i)	500	
4(a)(ii)	496	
4(a)(iii)	502	
4(a)(iv)	86	1
4(b)	00000001 00010001 00000110 01100001 Both correct op codes Operand 0001 0001 Operand 0110 0001	3
4(c)	256	1
4(d)(i)	07 C2 07 C2	2 1 1
4(d)(ii)	LDI 63 LDI 63	2 1 1



Question	Answer																																																																																	
5(a)(i)	- Count the number of one bits in the <u>first seven</u> bit positions - Add a 0 or 1 to bit position 0, to make the count of one bits an <u>odd</u> number																																																																																	
5(a)(ii)	A = 1 B = 1																																																																																	
5(a)(iii)	Two from: - A parity bit is worked out for each <u>column</u> 1 - The computer checks the parity of each bit position in parity byte // the computer generates copy of the parity byte and <u>compares</u> 1 - If incorrect parity then there is an error in the data received // No parity error means no error in the data received 1 - The position of the incorrect bit can be determined 1	2																																																																																
5(b)(i)	<table><tr><th colspan="8">Bit position</th></tr><tr><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td></tr></table>	Bit position								7	6	5	4	3	2	1	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0	1	1	1	1	1	0	0	0	1	1	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	2
Bit position																																																																																		
7	6	5	4	3	2	1	0																																																																											
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1	1	1	1	0	0	0	1																																																																											
1	1	0	0	0	0	1	0																																																																											
0	0	1	0	0	1	0	0																																																																											
0	0	0	0	0	0	0	1																																																																											
0	1	0	1	1	0	0	0																																																																											
5(b)(ii)	Three from: - Consider each row in sequence 1 - Identify any row with incorrect parity 1 - Repeat the process for each column in sequence 1 - Identify where a row and column with incorrect parity intersect 1	3																																																																																



Question	Answer	
6(a)	Main memory management Input/Output Management Secondary storage Management Human computer interface The user moves the mouse on the desktop The user closes the Spreadsheet program The user selects the Save command to save their spreadsheet file The user selects the Print command to output their spreadsheet file One mark for each correct line from each left hand box to max <u>three</u> marks.	
6(b)(i)	File compression software	1
6(b)(ii)	Backup software	1
6(b)(iii)	Disk repair software	1
6(b)(iv)	Anti-virus software	1



Question	Answer	
7(a)	Two from: - The user's web browser is the client software - The requested web page has program code / script embedded <u>within it</u> - This code is interpreted by the web browser	1 1 1
7(b)	Four from: - The browser parses the URL to obtain the Domain Name - The browser software passes the Domain Name to the nearest Domain Name Server (DNS) - The DNS stores a list of Domain Names and matching IP addresses - The DNS Name Resolver looks for the Domain Name in its database - If found the corresponding IP address is returned to the originator - If not found the request is forwarded to another higher level DNS - The original DNS adds the returned IP address to its cache - The original DNS returns the IP address to the originator - The browser uses the IP address to request the required web page from the <u>web server</u> - The web server retrieves the page and delivers it to the originator - The browser software interprets <u>the script</u> and displays the web page	Max 4 1 1 1 1 1 1 1 1 1 1
7(c)(i)	Message1, Message2 x	1 1 2
7(c)(ii)	6 – 19	1
7(c)(iii)	11	1
7(c)(iv)	Checks that the product code has not be left blank // presence check on product code	1
7(c)(v)	Two checks from: One mark for check and one mark for description - Range check Check the number entered is (say) between 1 and 100 - Format check Checks the product code is a particular format // Checks the number has digit characters only // by example - Length check The number of items has exactly five characters - Existence check To ensure the product code has been assigned	Max 4 1 1 1 1 1 1

Question	Answer	
6(a)	Two from: - The <u>file</u> is made available from a web/email/FTP server - The user's <u>browser</u> is the client software - The client (software browser) <u>requests</u> the <u>file</u> from the server - The desired <u>file</u> is returned to the client computer	1 1 1 1
6(b)	1. The user keys in the Uniform Resource Locator (URL) into the browser Software. 2. E // The Domain Name Service (DNS) uses the domain name from the browser to look up the IP address of the web server. 3. D // The web server retrieves the page 4. F // Sends the web page content to the browser 5. B // Browser software renders the page and displays	1 1 1 1
6(c)(i)	Output1, Output2 RunnerID // Runner ID	1 1
6(c)(ii)	6 – 21	1
6(c)(iii)	13	1
6(c)(iv)	Checks that the RunnerID entered starts with the characters CAM or VAR only	1
6(c)(v)	Two checks from: One mark for check and one mark for description - Format check RunnerID is three letter characters followed by two digit characters //Position is digit characters only - Length check RunnerID has exactly five characters - Range check The value for Position is between 1 and (say) 50 - Presence check The text box for RunnerID or Position is not empty - Existence check To ensure that RunnerID has been registered - Uniqueness check To ensure no two runners have the same number	1 1 1 1 1 1 1 1

QUESTION 10.

Cambridge
International
AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level



COMPUTER SCIENCE

9608/11

Paper 1 Written Paper

October/November 2017

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.

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This document consists of **7** printed pages.



Cambridge Assessment
International Education



Question	Answer									
1(a)(i)	119									
1(a)(ii)	−120									
1(a)(iii)	<table border="1"><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>	1	1	1	0	1	1	1	1	
1	1	1	0	1	1	1	1			
1(a)(iv)	Lowest value: −128 Highest value: +127	1								
1(b)(i)	0110 0101 0011	1								
1(b)(ii)	The second block of four binary digits represents a digit larger than 9 // 14	1								
1(b)(iii)	A string of digits on any electronic device displaying numeric values	1								

Question	Answer	Marks
2(a)		4
2(b)(i)	One mark from: - The program code can be translated to run on any processor / platform - Source code is translated into machine independent intermediate code not machine dependent code	1



Question	Answer
2(b)(ii)	Two marks from: • Java uses a two-step translation process • Java code is partially interpreted – partially compiled • Code is translated first into intermediate code / "bytecode"... • ...using the Java compiler • The bytecode is finally interpreted by the Java Virtual Machine

Question	Answer	Marks																																													
3(a)	Two marks from: - Physical measures - Access rights - Encryption - Firewall - Use authentication methods such as usernames and passwords - Anti-malware program	Max 2																																													
3(b)(i)	<table border="1"><tr><td>7</td><td>X</td><td>6</td><td>=</td><td>42</td></tr><tr><td>8</td><td>X</td><td>5</td><td>=</td><td>40</td></tr><tr><td>6</td><td>X</td><td>4</td><td>=</td><td>24</td></tr><tr><td>5</td><td>X</td><td>3</td><td>=</td><td>15</td></tr><tr><td>3</td><td>X</td><td>2</td><td>=</td><td>6</td></tr><tr><td>1</td><td>X</td><td>1</td><td>=</td><td>1</td></tr><tr><td></td><td></td><td></td><td>Total:</td><td>128 / 11</td></tr><tr><td></td><td></td><td></td><td></td><td>11 R 7</td></tr><tr><td colspan="4">Check digit:</td><td>11 – 7 = 4</td></tr></table> 1 mark for 6 values 1 mark for 2 steps Accept 128 MOD 11 = 7 1 mark for subtraction Answer: 786531 4 (1 mark for answer)	7	X	6	=	42	8	X	5	=	40	6	X	4	=	24	5	X	3	=	15	3	X	2	=	6	1	X	1	=	1				Total:	128 / 11					11 R 7	Check digit:				11 – 7 = 4	4
7	X	6	=	42																																											
8	X	5	=	40																																											
6	X	4	=	24																																											
5	X	3	=	15																																											
3	X	2	=	6																																											
1	X	1	=	1																																											
			Total:	128 / 11																																											
				11 R 7																																											
Check digit:				11 – 7 = 4																																											
3(b)(ii)	One mark for name of check One mark for description Max two checks Uniqueness check Each PatientID must be unique Length check Each PatientID is exactly 7 characters Format check / Type check All 7 characters must be <u>digits</u> Presence check PatientID must be entered	Max 4																																													



Question	Answer																															
4(a)	A – System clock B – Control unit C – Main memory E – Control bus F – Data bus																															
4(b)	<table border="1"> <thead> <tr> <th>ACC</th><th>CountDown</th><th>OUTPUT</th></tr> </thead> <tbody> <tr> <td></td><td>15</td><td></td></tr> <tr> <td>67</td><td></td><td>C</td></tr> <tr> <td>15</td><td></td><td></td></tr> <tr> <td>14</td><td>14</td><td></td></tr> <tr> <td>51</td><td></td><td>3</td></tr> <tr> <td>14</td><td></td><td></td></tr> <tr> <td>13</td><td>13</td><td></td></tr> <tr> <td>32</td><td></td><td></td></tr> <tr> <td>88</td><td></td><td>x</td></tr> </tbody> </table> (1) (1) + (1) (1) (1)	ACC	CountDown	OUTPUT		15		67		C	15			14	14		51		3	14			13	13		32			88		x	5
ACC	CountDown	OUTPUT																														
	15																															
67		C																														
15																																
14	14																															
51		3																														
14																																
13	13																															
32																																
88		x																														
4(c)	Three marks from: - The assembler scans the assembly language instructions in sequence - When it meets a symbolic address checks to see if already in symbol table - If not, it adds it to the symbol table in the symbolic address column - If it is already in symbol table check if absolute address known - If the absolute address is known, it is entered in the appropriate cell - If the absolute address is not known mark / leave as unknown	Max 3																														
4(d)(i)	The op code / mnemonic / instruction table	1																														
4(d)(ii)	A – 1110 0110 0110 1000 (1) (1) B – E6 68 (1)	3																														



Question	Answer	
5(a)(i)	Three marks from: • Diaphragm / cone • (Voice) coil of wire • Spider / Suspension • (Permanent) Magnet • Basket • Dust cap • Outer frame	
5(a)(ii)	Four marks from: • Takes an electrical signal and translates it into physical vibrations to create sound waves • An electric current in the coil creates an electro-magnetic field • Changes in the audio signal causes the direction of the electric current to change • The direction of the current determines the polarity of the electro-magnet // changing the direction of the current changes the direction of the polarity of the electro-magnet • The electro-magnet is repelled by or attracted to the permanent magnet • Causing the coil to vibrate • The movement of the coil causes the cone / diaphragm to vibrate • That vibration is transmitted to the air in front of the cone / diaphragm as sound waves • The amount of movement will determine the frequency and amplitude of the sound wave produced	Max 4
5(b)(i)	One mark from: • External hard disk drive // SSD • External CD / DVD drive • Pen drive • Blu-ray drive	1
5(b)(ii)	Two marks from: • Additional secondary file storage // storing files • Backup of files • Archiving of files • Transfer files to second computer	Max 2



Question	Answer	
6(a)	Two marks from: - A system of moral principles - That guide behaviour / decision making - Based on philosophical / religious views - By example, e.g. respectful and considerate behaviour	
6(b)	One mark for identifying the issue One mark for correct principle One mark for possible action Max 2 issues (2 × 3 marks) 1 Uncomfortable with one of his colleagues Client and Employer // Management / Colleagues // Judgement // Self For example: Team building exercises // arranged meeting 2 Unfamiliar with programming language Self // Client and Employer // Product // Profession // Colleagues For example: Undergo training 3 Visit to unfamiliar workplace Client and employer // Management // Judgement // Profession // Colleagues For example: He should speak to his manager to discuss situation	Max 6

Question	Answer	Marks
7(a)(i)	<u>PatientID</u> } <u>DoctorID</u> } (1) <u>AppointmentDate, AppointmentTime</u> (1)	2
7(a)(ii)	<pre> graph TD PATIENT <--> DOCTOR PATIENT --> APPOINTMENT DOCTOR --> APPOINTMENT </pre> One PATIENT attends many APPOINTMENTs One DOCTOR takes many APPOINTMENTs Special case for 1 mark only (only if no one to many relationships shown) Many PATIENTs are seen by many DOCTORs	2



Question	Answer	
7(b)	Two marks from: Either: - Add an attribute (for example <code>Attended</code>) - To the appointment table // <code>APPOINTMENT</code> Or: - Add an attribute (for example <code>AppointmentsMissed</code>) - To the patient table // <code>PATIENT</code>	
7(c)(i)	Available to work at both <code>SITE-A</code> and <code>SITE-B</code>	1
7(c)(ii)	<code>APPOINTMENT(Site, AppointmentDate, AppointmentTime, DoctorID, PatientID)</code>	1
7(d)(i)	One mark per line <code>UPDATE DOCTOR</code> <code>SET DoctorID = '017'</code> <code>WHERE DoctorID = '117';</code>	3
7(d)(ii)	1 Mark per bullet, max 2 - Referential integrity should be maintained // Referential integrity could be violated. - Data becomes inconsistent - There may be records in the <code>APPOINTMENT</code> table showing doctor ID 117 - The <code>APPOINTMENT</code> table might not be automatically updated - Records in the <code>APPOINTMENT</code> table will become orphaned	Max 2
7(e)	One mark per line <code>SELECT AppointmentDate, AppointmentTime</code> <code>FROM APPOINTMENT</code> <code>WHERE PatientID = '556';</code>	3

QUESTION 11.



7(b)	1 Mark for correct answer Add attribute <code>VisitReportText</code> to table <code>VISIT</code>	1
7(c)(i)	1 Mark for each correct line <code>UPDATE CLIENT</code> <code>SET ClientName = 'Albright Holdings'</code> <code>WHERE ClientName = 'ABC Holdings';</code>	3
7(c)(ii)	1 Mark per bullet, max 2 • Referential integrity should be maintained // Referential integrity could be violated • Data becomes inconsistent • There may be records in the <code>VISIT</code> and <code>INTERVIEW</code> tables / other tables with client name ABC Holdings • The <code>ClientName</code> in the <code>VISIT</code> and <code>INTERVIEW</code> tables / other tables might not be automatically updated • Records in the <code>VISIT</code> and <code>INTERVIEW</code> tables / other tables will become orphaned	2



Question	Answer	
7(d)	1 Mark for each correct line SELECT StaffID FROM INTERVIEW WHERE ClientName = 'New Age Toys' AND VisitDate = '13/10/2016'; (Accept clauses other way round)	
7(e)	1 Mark for a correct answer Add a suitable attribute, for example, EuropeTraveller to the <u>STAFF</u> table // Add a suitable attribute, for example, Country to the <u>CLIENT</u> table	1

QUESTION 12.



Question	Answer	Marks
7(a)	1 mark for each correct join <pre>graph TD; MOVIE[MOVIE] --- MOVIESCHEDULE[MOVIESCHEDULE]; SCREEN[SCREEN] --- MOVIESCHEDULE;</pre>	2
7(b)	1 mark per bullet point • MovieID is the Primary Key in MOVIE • ... <u>links to</u> MovieID which is the Foreign Key in MOVIESCHEDULE • ScreenNumber is the Primary Key in SCREEN • ... <u>links to</u> ScreenNumber which is the Foreign Key in MOVIESCHEDULE	4
7(c)	1 mark per bullet point • ALTER TABLE MOVIE • ADD (COLUMN) ProductionCompany VARCHAR(25);	2



Question	Answer
7(d)	1 mark per bullet point Answer 1: • <code>SELECT Title, Rating</code> • <code>FROM MOVIE, MOVIESCHEDULE</code> • <code>WHERE MOVIE.MovieID = MOVIESCHEDULE.MovieID</code> • <code>AND MOVIESCHEDULE.ScreenNumber = 3;</code> Or Answer 2: • <code>SELECT Title, Rating</code> • <code>FROM MOVIE INNER JOIN MOVIESCHEDULE</code> • <code>ON MOVIE.MovieID = MOVIESCHEDULE.MovieID</code> • <code>WHERE MOVIESCHEDULE.ScreenNumber = 3;</code>

QUESTION 13.



Question	Answer	Marks
6(a)	1 mark for each method to max 2 • Biometric authentication // by example • Two-step authentication // by example • Firewall / proxy • Encryption • Different access rights for different users • Password protect <u>file</u> (using a different password) • Anti-malware	2
6(b)(i)	1 mark per bullet to max 2 • Pre-existing / pre-compiled / pre-written modules / code ... • ... can be linked into her program (without amendment) • To perform common / complex tasks	2



Question	Answer
6(b)(ii)	1 mark per bullet point. Max 2 for <u>one benefit</u>, max 2 for <u>one drawback</u> Benefit: • Less code needs to be written • ... saves time / saves re-inventing the wheel • Pre-tested // Used by many people • ... reduces time testing // can be fairly sure that the function will perform as it should • Can be written in a different programming language • ... making use of special features of that language • Can be complex algorithms (e.g. mathematical/graphics functions) • ... she does not need to work out how to write it // ...that she may not know how to code • Simplifies the program • ... since just the name of the function included in the source code Drawback: • Compatibility issues • ... may not work with the other code/may require changing program for it to work • Not guaranteed thorough testing • ... may be unknown or unexpected bugs / virus • Library routine may not meet exact needs • ... may give unexpected results // ... may need editing • If library routine is changed • ... there may be unexpected results / errors



Question	Answer
6(c)	1 mark per bullet point. Max 3 marks for interpreter, max 3 marks for compiler Interpreter: • Used during development • Debugging is easier • ... Because errors are reported as they are found // No need to wait until the end of the process for the error report • ... Because errors can be corrected as they are found Compiler: • Compiler used when development complete // compiler used when program ready for distribution • Produces an executable file (.exe) • ... After compilation the compiler does not need to be present for the program to run • ... The program can be given to others without access to (source) code • ... Final program does not need to be re-compiled each time it is run • Cross-compilation, the program can be compiled to run on different platforms

QUESTION 14.



Question	Answer	
6(a)	1 mark per bullet point to max 3 - The data from a single frame is split into two separate fields - One field has data for the odd numbered <u>rows/lines</u> and the other field has data for the even numbered <u>rows/lines</u> - Odd numbered line fields alternate with even numbered line fields - The viewer sees data from two frames simultaneously	
6(b)	1 mark per bullet point to max 1 - Produces what appears to be a higher refresh rate - Lower bandwidth needed // Halves the bandwidth requirements	1
6(c)	1 mark per bullet point to max 2 - Identifies pixels that do not change between frames - Records only the differences between the frames	2
6(d)(i)	1 mark per bullet point to max 3 - The amplitude of the wave is measured /sound wave is sampled - At <u>set/regular</u> time intervals - Each sample is stored as a binary number - Samples are stored in order in a file	3
6(d)(ii)	1 mark per bullet point to max 1 for each Sample rate: - Increasing the sample rate means more samples per second hence more bits per second <u>and</u> larger file size - Decreasing the sample rate means fewer samples per second hence fewer bits per second <u>and</u> smaller file size Sample resolution: - A higher sampling resolution means more bits per sample <u>and</u> a larger file size - A lower sampling resolution means fewer bits per sample. a smaller file size	2

QUESTION 15.



Question	Answer																
6(a)(i)	1 mark for touchscreen being both 1 mark for remaining 3 devices <table border="1"> <thead> <tr> <th>Device</th><th>Input</th><th>Output</th></tr> </thead> <tbody> <tr> <td>Touchscreen</td><td>✓</td><td>✓</td></tr> <tr> <td>Webcam</td><td>✓</td><td></td></tr> <tr> <td>Microphone</td><td>✓</td><td></td></tr> <tr> <td>Fingerprint scanner</td><td>✓</td><td></td></tr> </tbody> </table>	Device	Input	Output	Touchscreen	✓	✓	Webcam	✓		Microphone	✓		Fingerprint scanner	✓		
Device	Input	Output															
Touchscreen	✓	✓															
Webcam	✓																
Microphone	✓																
Fingerprint scanner	✓																
6(a)(ii)	1 mark for any 1 correct letter in the correct position 2 marks for any 2 correct letters in the correct positions 3 marks for any 3 correct letters in the correct positions 4 marks for 5 correct letters in the correct positions C An electric current is sent to the speaker. E The electric current passes through the coil. <i>The current in the coil creates an electromagnetic field.</i> A Changes in the audio signal cause the direction of the electrical current to change. This determines the polarity of the electromagnet. D The electromagnet is repelled by, or attracted to the permanent magnet. <i>The movement of the coil causes the diaphragm to vibrate.</i> B The vibration creates sound waves.	4															
6(b)(i)	To store files / software long term	1															
6(b)(ii)	1 mark per bullet point to max 3 - No moving parts - Solid state memory is non-volatile - Makes use of blocks / arrays of ... Semiconductors // NAND gates // NOR gates // transistors // integrated circuits - SSD Controller manages the components - Uses a grid of columns and rows that has two transistors at each intersection - One transistor is called a floating gate - The second transistor is called the control gate - Memory cells store voltages which can represent either a 0 or a 1 - Essentially the movement of electrons is controlled to read/write - Not possible to overwrite existing data // it is necessary to first erase the old data then write the new data in the same location	3															



Question	Answer	
6(c)	1 mark per bullet point to max 2 - RAM stores currently running parts of files / programs / processes / OS - ROM stores boot up instructions / OS kernel // data permanently // store the firmware for the tablet	
6(d)(i)	1 mark per bullet point to max 4 Max 3 for image Max 3 for sound Images - The images are stored as bitmaps - Each image is made up of pixels ... each pixel is of a single colour - Each colour has a unique binary number Store the sequence of binary numbers for each image / frame // store the binary value of each pixel Sound - Measure the height/amplitude of the sound wave - A set number of times per second // at regular time intervals - Each amplitude has a unique binary number Store the sequence of binary numbers for each sample	4
6(d)(ii)	1 mark per bullet point max 2 for each coding term. Interlaced encoding - The data from a single frame are encoded as two separate fields - One containing the data for the even numbered rows / lines and the other has the data for the odd numbered rows / lines - The image is rendered by alternating between the even field and the odd field of each successive frame - The viewer sees data from two frames simultaneously - The rate of picture display (the field rate) is twice the rate of image frame display (the frame rate) - Produces what appears to the eye to be a high refresh rate - Halves the transmission bandwidth requirements Progressive encoding - Stores the data for an entire frame - Displays all the frame data at the same time - The rate of picture display is the same as the frame rate - High bandwidth requirements	4



Question	Answer	
6(e)(i)	1 mark per bullet to max 3 • The data is compressed before transmitting • The video is transmitted continuously as a series of bits • The video is hosted on a media server • On download, the server sends the data to a buffer on the client computers // The buffer stores the data from the server • The recipient / user's software receives bit stream from the buffer	
6(e)(ii)	1 mark for: On-demand 1 mark for justification from: • The video does not need to be broadcast live // the video is already recorded • Dominic's colleagues will watch the video at a later date // at their convenience	2
6(e)(iii)	1 mark per description Temporal Redundancy • Pixels in a sequence of consecutive video frames have the same value in the same location Spatial Redundancy • A sequence of consecutive pixels in a single video frame have the same value	2

QUESTION 16.



Question	Answer												
7	1 mark for each correct addressing mode <table><tr><th>Addressing mode</th><th>Description</th></tr><tr><td>Relative</td><td>Form the address by adding the given number to a base address. Load the contents of the calculated address to the Accumulator (ACC).</td></tr><tr><td>Indirect</td><td>Load the contents of the address held at the given address to ACC.</td></tr><tr><td>Direct</td><td>Load the contents of the given address to ACC.</td></tr><tr><td>Indexed</td><td>Form the address from the given address + the contents of the Index Register. Load the contents of the calculated address to ACC.</td></tr><tr><td>Immediate</td><td>Load the given value directly to ACC.</td></tr></table>	Addressing mode	Description	Relative	Form the address by adding the given number to a base address. Load the contents of the calculated address to the Accumulator (ACC).	Indirect	Load the contents of the address held at the given address to ACC.	Direct	Load the contents of the given address to ACC.	Indexed	Form the address from the given address + the contents of the Index Register. Load the contents of the calculated address to ACC.	Immediate	Load the given value directly to ACC.
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