CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the May/June 2015 series

9608 COMPUTER SCIENCE

9608/12 Paper 1 (Written Paper), maximum raw mark 75

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CAMBRIDGE
International Examinations

1 (i) B 8 **[1]**

(ii) 1 0 0 1 0 1 1 1 **[1]**

(iii)

114	**0**	**1**	**1**	**1**	**0**	**0**	**1**	**0**
– 93	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**1**

[2]

2 (a) (i) Any **one** from:

- amplitude of sound wave taken at different points in time
- measurement of value of analogue signal at regular time intervals/a point in time **[1]**

(ii) Any **one** from:

- bit depth/sampling resolution sufficient for good quality sound
- higher bit depth/sampling resolution would mean bigger files
- ...hence less (music) content on each CD
- can represent dynamic range of about 90 dB
- 90 dB is basically the maximum dynamic range of human hearing
- compromise between quality and reasonable file size **[1]**

(iii) Any **two** from:

- resolution is the number of distinct values available to encode/represent each sample
- specified by the number of bits used to store/record each sample
- sometimes referred to as bit depth
- the higher the sampling resolution, the smaller the quantization error
- a higher sampling resolution results in less distortion of the sound
- usually 8 bit, 16 bit, 24 bit or 32 bit **[2]**

(iv) **1 mark** for benefit and **1 mark** for drawback.

benefit

- allows for larger dynamic ranges
- ...as dynamic range is approximately six times the bit depth
- more accurate representation/crisper sound quality

drawback

- bigger files/occupies more memory/storage
- longer to transmit data/download music
- greater processing power needed **[2]**

(b) Any **two** from:

- edit start time, stop time and duration of any sound/timeline
- extract/delete/save part of a clip
- frequency, amplitude, pitch alteration
- fade in/out of a clip
- mix/merge multiple sound sources/tracks
- combine different sources at various volume levels
- pan between tracks/channels
- use of filters
- playback to speakers, processors or recording medium
- conversion between different audio file formats
- etc... **[2]**

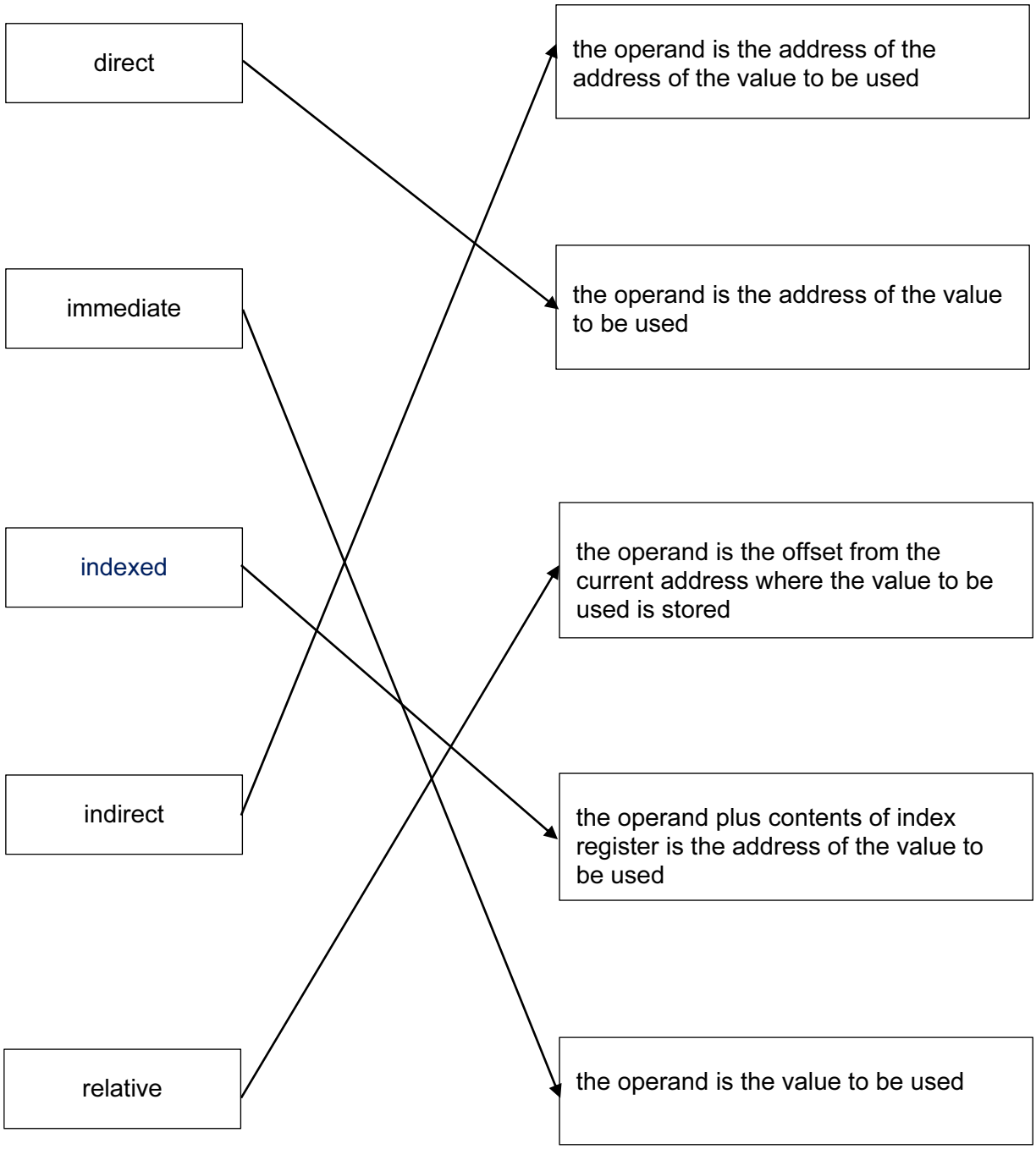
(c) Any **three** from:
For full marks both techniques must be mentioned.

- lossless designed to lose none of the original detail/lossless allows original file to be recreated exactly
- lossless technique based on some form of replacement
- mention of type of replacement, for example RLE, FLAC etc.
- by example: e.g. 000–1111–222222–333 = 3–0, 4–1, 6–2, 3–3 etc.
- maximum compression about 50%
- lossy may result in loss of detail compared to original file/lossy does not allow original file to be re-created exactly
- lossy techniques make decision about what parts of sound/sound file are important and discards other information
- only keeps sounds human ear can process/discards sounds most people cannot hear
- ... then applies lossless technique, for further reduction
- lossy compression can reduce to about 10%
- an example of jpeg, mp3 or other correct examples of compressed formats.

No double credit to opposite answers, e.g. lossless maintains detail, but lossy loses detail just one mark.

[3]

3



[4]

4 (a) answer requires a **different sensor** for **each** part, **1 mark** for each part

(i) temperature/thermistor **[1]**

(ii) moisture, humidity, light/photodiode, temperature, pH **[1]**

(iii) sound/acoustic, infrared, pressure, motion, microwave **[1]**

(b) **1 mark** for name + **3 marks** for description

parity check

- uses even or odd parity which is decided before data sent
- each byte has a parity bit
- parity bit is set to 0 or 1 to make parity for byte correct
- after transmission, parity of each byte re-checked
- if it is different, then an error is flagged
- any reference to use of parity blocks/parity byte to (identify position of incorrect bit)

checksum

- a calculation is carried out on the data to be sent (checksum)
- the result is sent, along with data to recipient
- checksum is re-calculated at receiving end
- if both sums are the same, no error has occurred
- if the sums are different, the data has been corrupted during transmission
- request is sent to re-send data

[4]

5 (a)

Description	Conventional telephone using PSTN	Internet-based system
connection only in use whilst sound is being transmitted		✓
dedicated channel used between two points for the duration of the call	✓	
connection maintained throughout the telephone call	✓	
encoding schemes and compression technology used		✓
lines remain active even during a power outage	✓	

[5]

(b) **maximum** of **two marks** for Internet references and **maximum** of **two marks** for world wide web references

Internet

- massive network of networks/interconnected network of computer devices
- Internet stands for Interconnected Networks
- uses TCP/IP protocol

World Wide Web (www)

- is a collection of (multimedia) web pages/documents
- ...stored on websites
- http/protocols used to transmit data
- web pages are written in HTML
- URLs specify the location of the web pages
- web documents are accessed using browsers **[3]**

(c) **(i)** router **[1]**

(ii) gateway **[1]**

(iii) server **[1]**

6 (a)

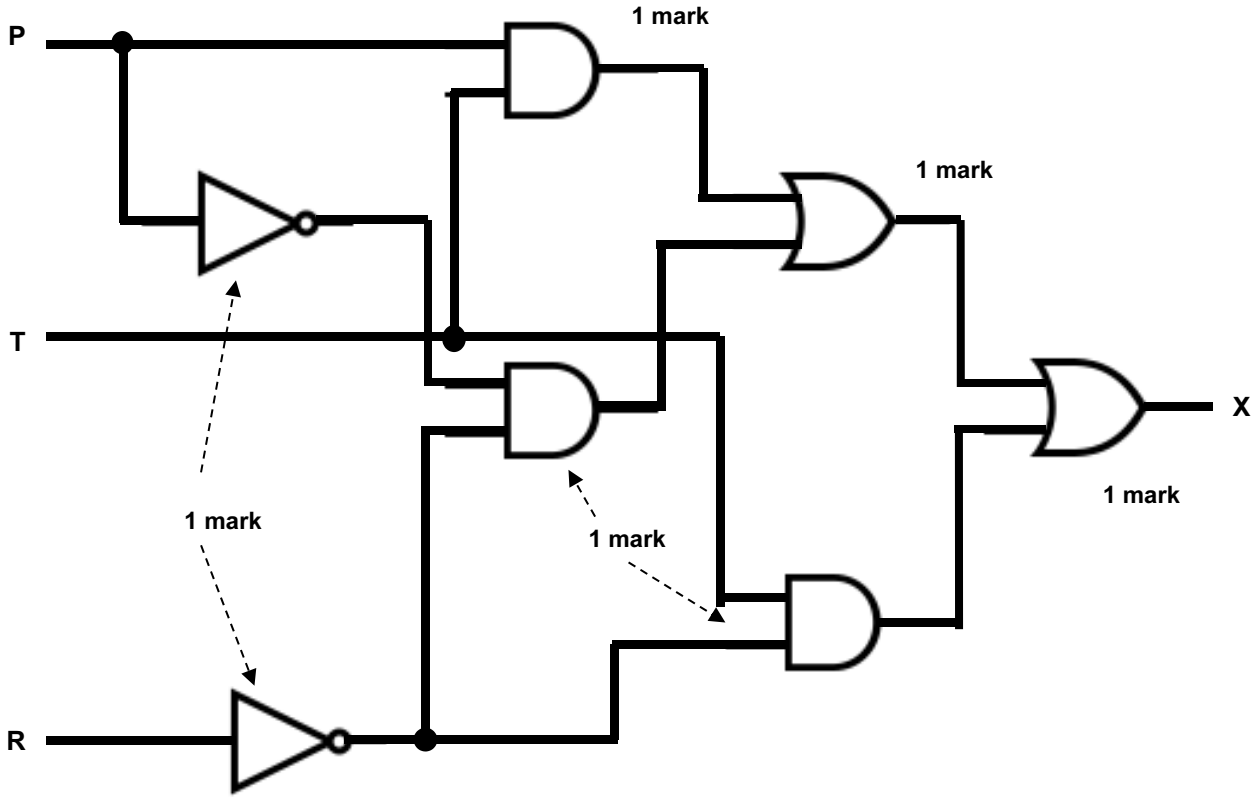
Description of use	Input or output device
input of credit card number into an online form	**Keyboard/keypad/numberpad**
selection of an option at an airport information kiosk	**touch screen**
output of a singe high quality photograph	**ink jet printer**
output of several hundred high quality leaflets	**laser printer**
input of a hard copy image into a computer	**scanner**

[5]

(b) (i) Any **two** from:
- frequent (or equivalent) backup EITHER to secondary media/to 3rd party server/cloud/removable devices/continuous backup OR stored remotely
- disk-mirroring strategy/RAID
- UPS (uninterruptable power supply)/backup generator **[2]**

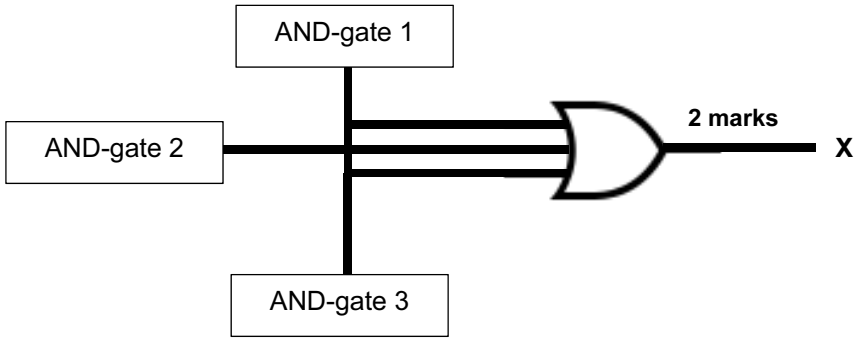
(ii) Any **one** from:
- protection of data (or equivalent) with passwords/using password and username for logging on include e.g. fingerprint scanning
- encryption
- installation and use of up to date anti-malware/anti-virus
- give different access rights to different users
- use a firewall,
- physical methods/lock doors and use secure entry devices/CCTV **[1]**

7 (a) Since it is possible to simplify the original conditions, at least 3 possible answers exist for the logic circuit.

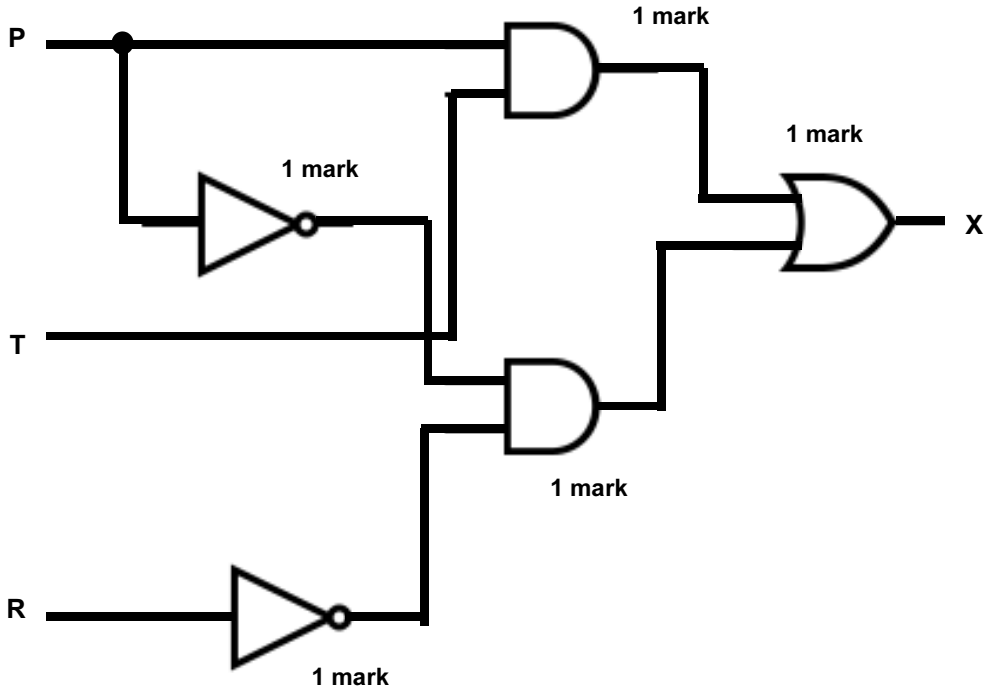


Note: input T has 2 cross overs that should not be connections

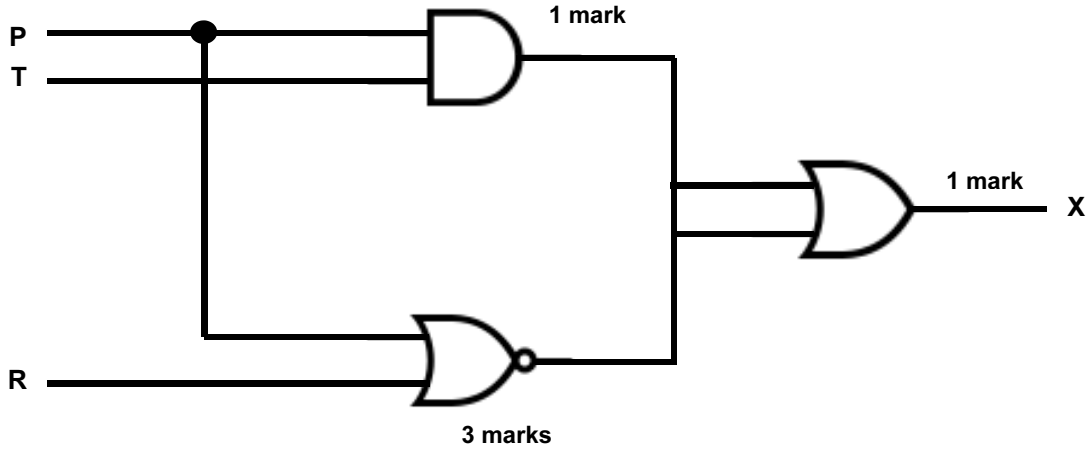
Note: it is possible to use a 3-input OR gate rather than the two 2-input OR gates on the top right:



Alternative solution 1:



Alternative solution 2:



[5]

Note: other solutions may be possible depending on how simplification of the original statement is done

(b)

P	T	R	Workspace	X	
0	0	0		1	} 1 mark
0	0	1		0	
0	1	0		1	} 1 mark
0	1	1		0	
1	0	0		0	} 1 mark
1	0	1		0	
1	1	0		1	} 1 mark
1	1	1		1	

[4]

8 (a) **maximum** of **2 marks** for data bus width and **maximum** of **2 marks** for clock speed

data bus width

- the width of the data bus determines the number of bits that can be simultaneously transferred
- increasing the width of the data bus increases the number of bits/amount of data that can be moved at one time (or equivalent)
- …hence improving processing speed as fewer transfers are needed
- By example: e.g. double the width of the data bus moves 2x data per clock pulse

clock speed

- determines the number of cycles the CPU can execute per second
- increasing clock speed increases the number of operations/number of fetch-execute cycles that can be carried out per unit of time
- ...however, there is a limit on clock speed because the heat generated by higher clock speeds cannot be removed fast enough **[3]**

(b) Any **two** from:

- devices automatically detected and configured when first attached/plug and play
- it is nearly impossible to wrongly connect a device
- USB has become an industrial standard
- supported by many operating systems
- USB 3.0 allows full duplex data transfer
- later versions are backwards compatible with earlier USB systems
- allows power to be drawn to charge portable devices **[2]**

(c)

Description of stage	Sequence number
the instruction is copied from the Memory Data Register (MDR) and placed in the Current Instruction Register (CIR)	**3**
the instruction is executed	**6**
the instruction is decoded	**5**
the address contained in the Program Counter (PC) is copied to the Memory Address Register (MAR)	**1**
the value in the Program Counter (PC) is incremented so that it points to the next instruction to be fetched	**4**
the instruction is copied from the memory location contained in the Memory Address Register (MAR) and is placed in the Memory Data Register (MDR)	**2**

[6]

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 **[1]**

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

table: `SalesPerson`

FirstName	Shop
Nick	TX
Sean	BH
John	TX

table: `SalesProducts`

FirstName	ProductName	NoOfProducts	Manufacturer
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]

(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 **[2]**

(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]**