CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the May/June 2015 series

9608 COMPUTER SCIENCE

9608/13 Paper 1 (Written Paper), maximum raw mark 75

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1 (a) (i)

124	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**0**
–77	**1**	**0**	**1**	**1**	**0**	**0**	**1**	**1**

[2]

(ii) 124: 7 C

–77: B 3 [2]

(b) (i) 0 0 1 1 0 1 0 1 1 0 0 1 [1]

(ii)
- when denary numbers need to be electronically coded
- e.g. to operate displays on a calculator where each digit is represented
- decimal fractions can be accurately represented [2]

2

Activity	First pass or second pass
any symbolic address is replaced by an absolute address	**2**
any directives are acted upon	**1**
any symbolic address is added to the symbolic address table	**1**
data items are converted into their binary equivalent	**1**
forward references are resolved	**2**

[5]

3 (a) maximum of **two marks** for firewall description + maximum of **two marks** for authentication description

Firewall

- sits between the computer or LAN and the Internet/WAN and permits or blocks traffic to/from the network
- can be software and/or hardware
- software firewall can make precise decisions about what to allow or block as it can detect illegal attempts by specific software to connect to Internet
- can help to block hacking or viruses reaching a computer

Authentication

- process of determining whether somebody/something is who/what they claim to be
- frequently done through log on passwords/biometrics
- because passwords can be stolen/cracked, digital certification is used
- helps to prevent unauthorised access to data [3]

(b) **one** mark for security, **one** mark for integrity:

- integrity deals with validity of data/freedom from errors/data is reasonable
- security deals with protection of data
- security protects data from illegal access/loss
- integrity deals with making sure data is not corrupted after, for example, being transmitted [2]

(c) (i) **one mark** for each way of maintaining data security + **one mark** for an example/ enhancement

- validation (to ensure data is reasonable)
- examples include range checks, type checks, length checks, …

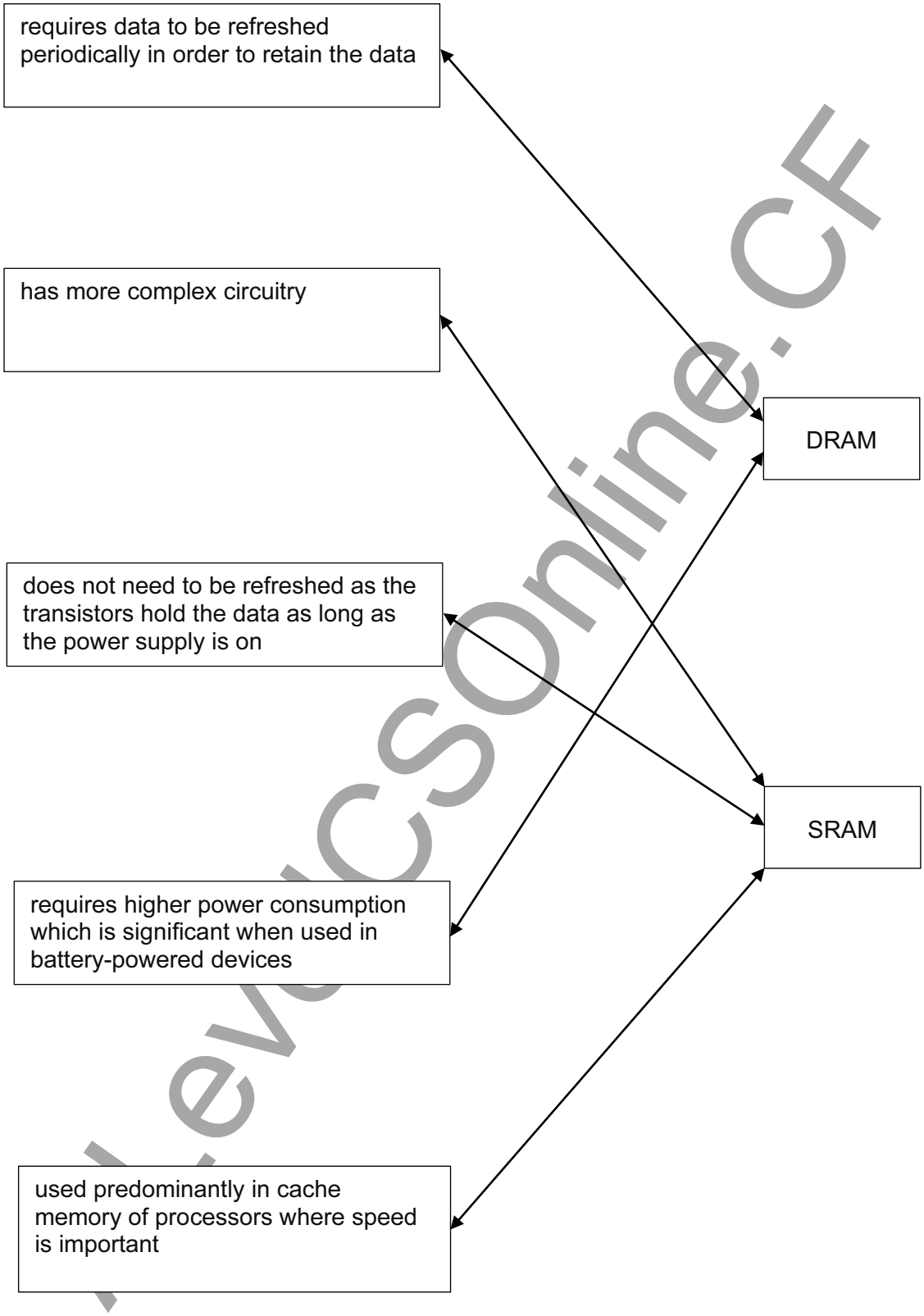
- verification (checks if data input matches original/if transmitted data matches original)
- can use double data entry or visual check/other methods such as parity checks
- doesn't check whether or not data is reasonable [3]

(ii) **one mark** for each way of maintaining data integrity + **one mark** for an example/ enhancement

- parity checking
- one of the bits is reserved as parity bit
- e.g. 1 0 1 1 0 1 1 0 uses odd parity
- number of 1s must be odd
- parity is checked at receiver's end
- a change in parity indicates data corruption

- check sum
- adds up bytes in data being sent and sends check sum with the data
- calculation is re-done at receiver's end
- if not the same sum then the data has been corrupted during transmission [3]

4 (a)



[5]

(b) maximum of **two marks** for RAM and maximum of **two marks** for ROM

RAM

- loses contents when power turned off/volatile memory/temporary memory
- stores files/data/operating system currently in use
- data can be altered/deleted/read from and written to
- memory size is often larger than ROM

ROM

- doesn't lose contents when power turned off/non-volatile memory/permanent memory
- cannot be changed/altered/deleted/read only
- can be used to store BIOS/bootstrap [3]

(c) **one** mark for DVD-RAM, **one** mark for flash memory.

DVD-RAM

- data is stored/written using lasers/optical media
- DVD-RAM uses phase changing recording, in which varying laser intensities cause targeted areas in the phase change recording layer to alternate between an amorphous and a crystalline state.
- uses a rotating disk with concentric tracks
- allows read and write operation to occur simultaneously

flash memory

- most are NAND-based flash memory
- there are no moving parts
- 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 over-write existing data; it is necessary to first erase the old data then write the new data in the same location [2]

5 (a) **one mark** for name of bus + **one mark** for description

address bus

- lines used to transfer address of memory or input/output location
- unidirectional bus

data bus

- used to transfer data between the processor and memory/input and output devices
- bidirectional bus

control bus

- used to transmit control signals
- e.g. read/write/fetch/ …
- dedicated bus since all timing signals are generated according to control signal [6]

(b) (i) the program counter is incremented [1]

(ii) the data stored at the address held in MAR is copied into the MDR [1]

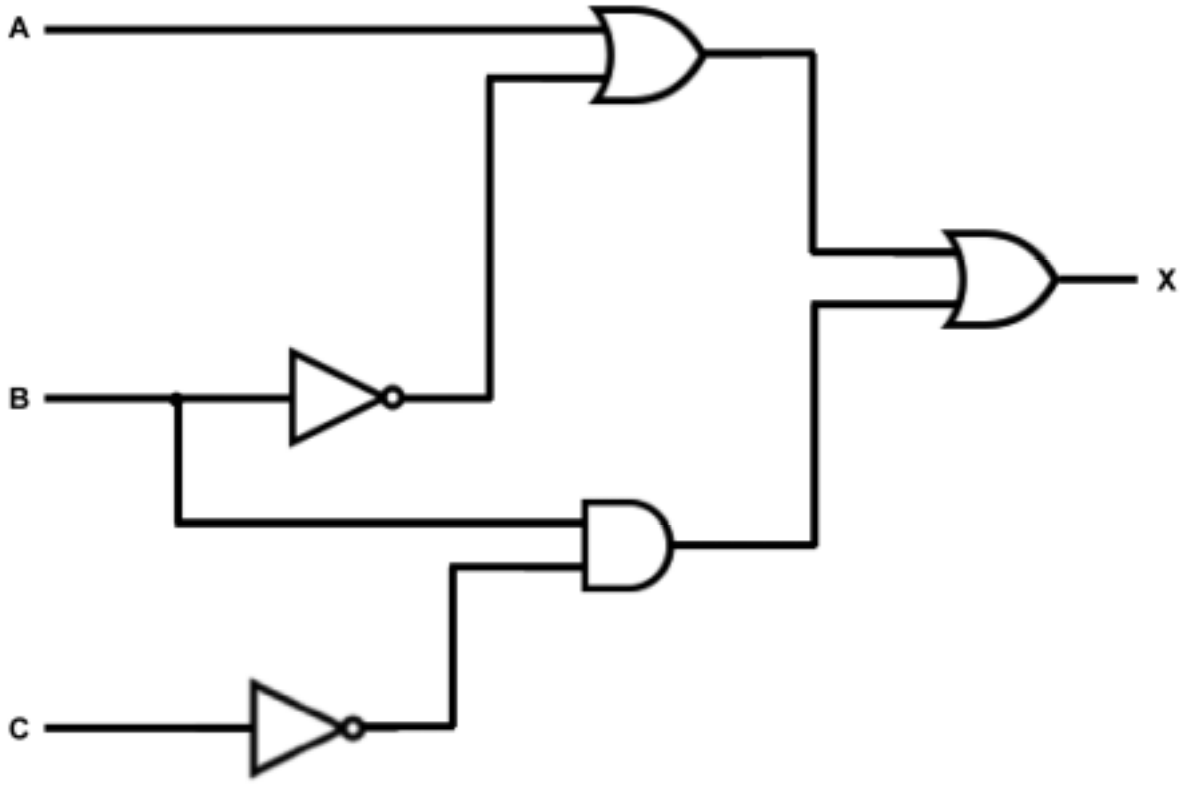
(iii) the contents of the Memory Data Register is copied into the Current Instruction Register [1]

(c)
- the MAR is loaded with the operand of the instruction // loaded with 35
- the Accumulator is loaded with the contents of the address held in MAR // the Accumulator is loaded with the contents of the address 35 [2]

(d) (i)
- a signal
- from a device/program that it requires attention from the processor [2]

(ii)
- at a point during the fetch-execute cycle …
- check for interrupt
- if an interrupt flag is set/ bit set in interrupt register
- all contents of registers are saved
- PC loaded with address of interrupt service routine [4]

6 (a)



[5]

(b)

A	B	C	working	X	
0	0	0		1	} 1 mark
0	0	1		1	
0	1	0		1	} 1 mark
0	1	1		0	
1	0	0		1	} 1 mark
1	0	1		1	
1	1	0		1	} 1 mark
1	1	1		1	

[4]

(c) ((A is NOT 1 AND B is 1) OR (B is NOT 1 OR C is 1)) AND C is NOT 1
< – – – – – 1 mark – – – – – > < – – – – – 1 mark – – – – – > < – – – – – 1 mark – – – – – >

NOTE: all brackets may not be shown – but check answer still correct

Alternatives include:

((NOT A AND B) OR (NOT B OR C)) AND NOT C

$(\overline{A} . B + (\overline{B} + C)) . \overline{C}$

NOTE: expressions may be reversed but still OK

(e.g. NOT C AND ((NOT A AND B) OR (NOT B OR C))

NOT C AND ((NOT B OR C) OR (NOT A AND B)) and so on) [3]

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]