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CAMBRIDGE
International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/13**

Paper 1 Theory Fundamentals **October/November 2024**

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.

Cambridge International will not enter into discussions about these mark schemes.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

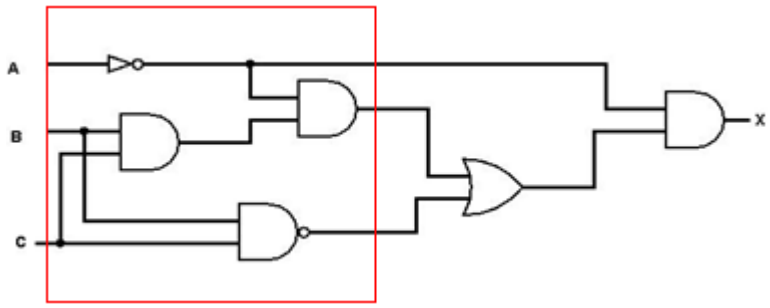
Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Question	Answer	Marks
1(a)	**1 mark** for: Output is only 1 if one input is 1 and the other is 0 // Output is only 1 if both inputs are different // Output is only 0 if both inputs are the same	**1**
1(b)	**1 mark** each: • ((**A** NOR **B**) AND (**A** OR **B**)) • NAND (**B** AND **C**) **X** = ((**A** NOR **B**) AND (**A** OR **B**)) NAND (**B** AND **C**)	**2**
1(c)	**1 mark** for NOT gate, 2 correct AND gates and the NAND gate **1 mark** for OR gate and the final AND gate 	**2**

Question	Answer	Marks
2(a)	**1 mark** for each difference e.g. • DRAM requires constant refreshing, but SRAM does not need to be constantly refreshed • DRAM generally has greater capacities per chip, but SRAM generally has lower capacities per chip • DRAM has slower access times than SRAM	**2**
2(b)	**1 mark** for each bullet point (**max 4**) • The computer and the hard disk drive transmit and receive at different speeds // The computer transfers data faster than the HDD can receive • The buffer is used for temporary storage • … so that the computer can transfer data to the buffer at the higher speed • ... and is not held up waiting for data to transfer • … and so that data is transferred to hard disk drive from the buffer at the slower rate	**4**

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Question	Answer	Marks
3	**1 mark** for each bullet point (**max 3**) • The system uses feedback • The system acts independently • Input data causes the car to brake • … braking decreases the/changes the distance to the object • … this new distance is used to determine whether/how hard the car needs to brake	**3**

Question	Answer	Marks
4(a)	**1 mark** each: • Foreign key: `BatchID`, table `BATCH` • Foreign key: `CustomerID`, table `CUSTOMER`	**2**

4(b)	**1 mark** each:
	
	• `SELECT SUM(Quantity)`
	• `FROM SALE WHERE` and one correct condition
	• `AND` with remainder correct conditions
	
	e.g.
	`SELECT SUM(Quantity)`
	`FROM SALE`
	`WHERE CustomerID = "0034E"`
	`AND Date >= #01/01/2023# AND Date <= #31/12/2023#;`
		3

4(c)(i)	**1 mark** for each bullet point
	
	• Create table `BATCH` with opening and closing brackets, all statements within brackets
	• `BatchID`, `Type` and `Flavour` as varchar or equivalent
	• …with suitable constraint(s)
	• `Size` as decimal, `SellingPrice` as currency, `EndDate` as date (or equivalent)
	• Primary key identified as `BatchID`
	
	e.g.
	`CREATE TABLE BATCH(`
	`  BatchID VARCHAR(6) NOT NULL,`
	`  Type VARCHAR (20) NOT NULL,`
	`  Flavour VARCHAR (20) NOT NULL,`
	`  Size FLOAT,`
	`  SellingPrice CURRENCY,`
	`  EndDate DATE,`
	`  PRIMARY KEY(BatchID)`
	`);`
		5

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Question	Answer	Marks

4(c)(ii)	**1 mark** for each bullet point each (**max 4**)
	
	e.g.
	• Ice cream table with an appropriate name
	• … containing type, flavour, size, selling price
	• … with suitable primary key
	• … foreign key identified in `BATCH` that links to the primary key in `ICECREAM`
	
	Example table definitions – not example answer:
	
	`BATCH(BatchID, IceCreamID, EndDate)`
	`ICE_CREAM(IceCreamID, Type, Flavour, Size, SellingPrice)`
		4

4(d)	**1 mark** for each definition Entity: • A real-life object that is represented as a table Attribute: • An item of data about an entity	**2**
4(e)	**1 mark** for each bullet point each (**max 3**) • Referential integrity is enforced • … such as cascade update/delete // if the data is changed in one place it is updated in every other place • ... and ensures each foreign key has a corresponding primary key	**3**

Question	Answer	Marks
5(a)	**1 mark** for each correct licence	**3**

Statement	Software Licence
A fee is charged for the software. The source code cannot be accessed. Users do not get a free trial.	**Commercial**
Users can try the software before buying it. Users may not be able to access all features during the trial.	**Shareware**
Software is usually free of charge. Users can access the source code and alter the program to their needs.	**Open Source** // **Free software**

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Question	Answer	Marks
5(b)	**1 mark** for each bullet point (**max 3**) e.g. • The professional ethical body has ethical guidelines to follow • … so clients/other staff know the standards being applied • … so the computer programmer does not have to decide what is ethical it's written down • Clients/staff know the computer programmer is reputable • … there may be a test/requirement for entry • … giving recognition of the computer programmer's skills/knowledge • The professional ethical body provides help and support • … for example, if the computer programmer needs legal advice • The professional ethical body runs training courses • … to keep the computer programmer's skills up to date	3

Question	Answer	Marks
6(a)	**1 mark** for identification **1 mark** for matching description e.g. • ASCII • 7/8 bits per character // represents 128/256 characters // represents all characters from Latin alphabet • UNICODE • 8/16/32 bits per character // represents 256/65536+ characters // represents all characters in all languages	**2**
6(b)(i)	**1 mark** for: 256 // 2^8	**1**
6(b)(ii)	**1 mark** for: Increased file size	**1**
6(b)(iii)	**1 mark** for each bullet point (**max 2**) e.g. • The change may not be noticeable // Data removed is usually not noticed by the human eye • … for example, changes in shade/detail • It produces a larger decrease in file size compared to lossless // Lossy decreases file size considerably	**2**
6(c)(i)	**1 mark** for each bullet point (**max 2**) • Value/magnitude/size of the analogue sound wave is measured a set number of times each second/time / at set intervals • Each sample/reading/measurement is given the binary number and stored in sequence	**2**

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Question	Answer	Marks
6(c)(ii)	**1 mark** for each correct point and **1 mark** for matching expansion e.g. • Decrease sample rate • … fewer samples/readings/measurements stored per second // fewer bits per second stored • Decrease sample resolution • … fewer bits per sample/reading/measurement // each sample has fewer bits • Sound outside of set/human hearing range is removed • … fewer measurements are stored / decreases the number of possible binary values so fewer bits are stored	**2**

Question	Answer	Marks
7(a)	**1 mark** each: Instructions / ACC content 1: `LDD 50` `ADD #4` `ADD 54` — **158** 2: `LDI 53` `DEC ACC` `ADD 56` — **99** 3: `LDM #55` `SUB #5` — **50**	**3**
7(b)	**1 mark** for each bullet point for the explanation **1 mark** for correct instruction • A bit manipulation operation is required to set all the bits to zero • Compare the result of the masking with 0 • … the result of comparison will be true if the register is cleared • AND B00000000 / #00 / &00	**3**

Question	Answer	Marks
8(a)	**1 mark** for: Denary value: 8107	**1**

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Question	Answer	Marks
8(b)	**1 mark** for each bullet point for the method (**max 2**) e.g. • Flip each bit then add 1 … • … method of converting the new binary number into denary • Most significant 1 bit is treated as the corresponding negative denary value … • … add the other positive corresponding denary values **1 mark** for correct conversion Denary value: −97	**3**
8(c)	**1 mark** each: • A logical shift moves all bits to the right and inserts zeros in the appropriate leftmost bits • An arithmetic shift moves all bits to the right but copies the sign bit into the Most Significant Bit (MSB)	**2**

Question	Answer	Marks
9(a)	**1 mark** for each bullet point (**max 2**) • A WAN covers a large geographical area • External/public infrastructure is used • Non-dedicated hardware	**2**
9(b)	**1 mark** for correct media **1 mark** for matching description e.g. • Fibre optic • Transmits data as pulses of light • Radio waves / microwaves • Transmits electromagnetic waves on different frequencies	**4**
9(c)	**1 mark** for each bullet point (**max 4**) • Data is compressed before transmitting • The video and audio are transmitted continuously as a series of bits • The video is uploaded to a media server • On download, the media server sends the data to a buffer • The buffer stores data from server until the receiving device can process it • The receiving device receives the bit stream from the buffer	**4**

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Question	Answer	Marks
9(d)(i)	**1 mark** for public IP address and **1 mark** for private IP address: Public IP address: • So that the router is visible to the Internet/external network/WAN Private IP address: • So that the router is identified to computers within the LAN	**2**
9(d)(ii)	**1 mark** for each bullet point (**max 2**) • It allows the network to be divided into smaller networks • … which reduces traffic in some parts of the network // reduces congestion • … because traffic only travels through the parts necessary • … which hides the complexity of network • … and allows for easier maintenance of the network	**2**

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