Cambridge Assessment International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/11**

Paper 1 Theory Fundamentals **October/November 2023**

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.

Cambridge International is publishing the mark schemes for the October/November 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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 descriptors 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:

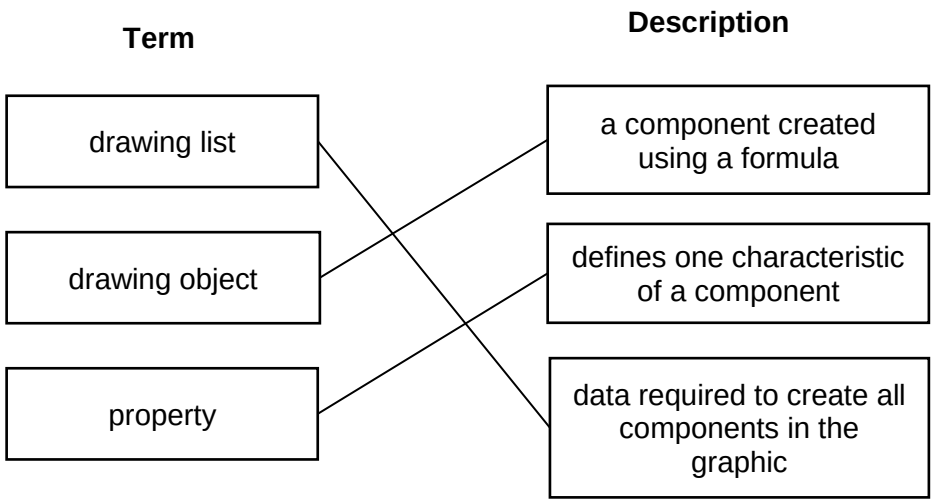
Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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).

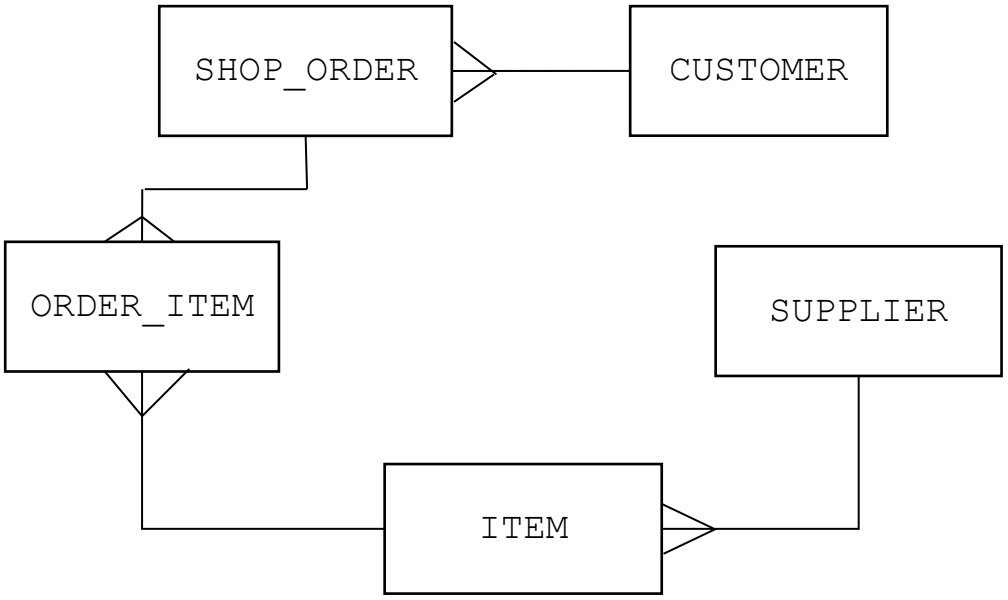
GENERIC MARKING PRINCIPLE 6:

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.

Question	Answer	Marks
1(a)	**2 marks** for all 3 lines correct **1 mark** for 1 line correct 	**2**
1(b)	**1 mark** for the definition • The number of bits used to represent each colour **1 mark** for each bullet point for the explanation • Increase in bit depth means the image has a greater range of colours // Decrease in bit depth means the image has a smaller range of colours • Increase in bit depth makes the image closer to the original / more realistic // Decrease in bit depth makes the image less like the original / less realistic	**3**
1(c)	**1 mark** for each bullet point (**max 2**) • Reduced bandwidth usage when transmitting the message • Reduced transmission time from email client to email server • Reduced storage space **on the email** • Email accounts often have a maximum size for an attachment	**2**

Question	Answer	Marks
2(a)	**1 mark** for each bullet point (**max 3**) • Receives packets from internet / external network • Implements a firewall • Analyses the destination IP address of each packet • Forwards the packet towards its destination // send packets onto local network or external network • ...using the routing table • Maintains / updates the routing • Allocates private IP addresses • Finds the most efficient route to the destination • Changes the packet format for transmission over the next network // • Network Address Translation (NAT):NAT is a technique used by routers to allow multiple devices in a private local area network (LAN) to share a single public IP address.	**3**
2(b)	Switch: **1 mark** for each bullet point (**max 1**) • To allow two or more devices to communicate with one another • To connect individual devices to each other • To receive transmissions and **forward** them to their destination Wireless Access Point (WAP): **1 mark** for each bullet point (**max 1**) • To allow connection of devices (to the central device) **using radio signals** / Wi-Fi • To allow the central device to send / receive **radio signals** / Wi-Fi signals • To allow wireless enabled devices to connect to a wired network Bridge:**1 mark** for each bullet point (**max 1**) • To connect two LANs / segments with the **same protocol** • To transmit data between two networks with the **same protocol**	**3**
2(c)	**1 mark** for each bullet point (**max 2**) • The students cannot access their files without a reliable internet connection • The amount of space for no payment may be limited so students will have to purchase more space if needed • The students do not have control over the backup (or security) of their work // the students are dependent on a third party for the (security and) backing up of their work	**2**

Question	Answer	Marks
2(d)	**1 mark** for each advantage and **1 mark** for valid corresponding expansion • Star topology is more resilient to faults • …because there is no single cable and leads to less disruption to teaching • Higher performance as fewer collisions • ...because each device in the classroom is only connected to the switch • Easier to add new nodes • …because each device in the classroom connects directly to the switch • Easier to fault find compared to bus topology	**2**

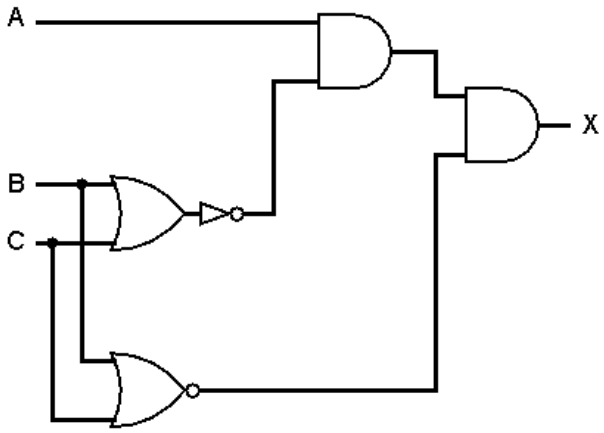
Question	Answer	Marks
3(a)	**1 mark** for each correct relationship or relationships • 1:M between CUSTOMER and SHOP_ORDER • 1:M between SUPPLIER and ITEM • 1:M between SHOP_ORDER and ORDER_ITEM **and** M:1 between ORDER_ITEM and ITEM  	**3**
3(b)	**1 mark** for each bullet point (**max 3**) • Reduced data **redundancy** • Improved data integrity / consistency / referential integrity • Allows for views / improved privacy • Allows for program-data independence • Complex queries can be executed	**3**

Question	Answer	Marks
3(c)(i)	**1 mark** for `CREATE DATABASE SHOP;`	**1**

3(c)(ii)	**1 mark** for each line (**max 4**)
	
	Either:
	`SELECT SUM(Quantity)`
	`FROM ORDER_ITEM, SHOP_ORDER`
	`WHERE ORDER_ITEM.OrderNo = SHOP_ORDER.OrderNo`
	`AND SHOP_ORDER.CustomerID = 'HJ231';`
	OR
	`SELECT SUM(Quantity)`
	`FROM ORDER_ITEM (INNER) JOIN SHOP_ORDER`
	`ON ORDER_ITEM.OrderNo = SHOP_ORDER.OrderNo`
	`WHERE SHOP_ORDER.CustomerID = 'HJ231';`
		4

Question	Answer	Marks
4(a)	**1 mark** for each set of 4 rows (shaded)	**2**

A	B	C	X
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

Question	Answer	Marks
4(b)	**1 mark** for both AND gates **1 mark** for NOT gate and OR gate and NOR gate 	**2**

Question	Answer	Marks
5(a)	**1 mark** for identification of the register and **1 mark** for role (**max 2** for each register) • Program Counter (PC) • stores the address where the next instruction is to be read from • Memory Address Register (MAR) • stores the address of the memory location (or an I/O component) **currently being read from** or **written to** • Current Instruction Register (CIR) • holds the instruction currently being decoded and/or executed • Status Register • Contains bits which can be referenced individually and set or cleared depending on the operation e.g. overflow, underflow	**4**
5(b)	**1 mark** for each bullet point (**max 2**) • Immediate Access Store holds all the data / instructions / programs currently in use • Immediate Access Store is volatile memory • Immediate Access Store has fast access times	**2**
5(c)(i)	**1 mark** for each bullet point (**max 1**) • The CPU can now perform nearly twice as many **F-E cycles** per second • Instead of 2.1 billion **F-E cycles** per second, the CPU can now perform 4 billion **FE cycles** per second	**1**

Question	Answer	Marks
5(c)(ii)	**1 mark** for each bullet point (**max 5**) • Multiple cores introduce additional overheads • …because of the need for communication between cores • Software may not be designed for multiple cores… • …so one of the cores will be left idle • Memory access speed may not match speed of cores… • …so causing delay • The two computers may have more differences than just the cores • …one may have more RAM which allows faster multitasking • ...one may have a GPU • ...etc.	**5**

Question	Answer	Marks
6(a)	**1 mark** for each bullet point (**max 4**) • easier to debug the program • … because it translates line-by-line and stops when an error is found whereas the compiler translates all the program at the same time • … only reporting one error at a time • … which allows the error to be corrected in real time whereas the program would need to be corrected and recompiled • ... and the program can restart at same point when error occurred with a compiler the program needs to be re-run • The effect of any changes made by the programmer can be seen immediately with a compiler the effects can only be seen after re-running • A partially completed program can be translated / tested on its own a compiler cannot translate a partial program	**4**
6(b)	**1 mark** for each bullet point (**max 1**) • Partially compiled programs can be used on different platforms as they are interpreted when run • Code is optimised for the CPU as machine code is generated at run time • Source code does not need recompiling so more efficient to run	**1**
6(c)(i)	**1 mark** for each bullet point (**max 2**) • Prettyprint • Expand/collapse code blocks • **Auto** indentation / formatting	**2**
6(c)(ii)	**1 mark** for each bullet point **(max 2**) • Single stepping • Breakpoints • Report window • Variable expressions	**2**

Question	Answer	Marks
7(a)	**1 mark** for each bullet point (**max 3**) Generic mark points: • Additive manufacturing • Uses a digital 3D model or a Computer Aided Design (CAD) (file) • Builds up the model one layer at a time • ...starting from the bottom • ...using x, y and z co-ordinates • The material is fused / cured together layer by layer Specific mark points: **Fused Deposition Modelling (FDM)** • Material is heated and pushed through nozzle / extruder **Stereolithography (SLA)** • Photosensitive liquid resin is exposed to a UV-laser beam **Digital Light Processing (DLP)** • Uses liquid plastic resin melted with arc lamps **Selective Laser Sintering (SLS)** • Uses a laser to form objects from powdered material	**3**
7(b)	**1 mark** for each bullet point (**max 2**) • To prevent **overheating** // ensure material is hot enough • ...by identifying the temperature of the object (being printed) • ...by identifying the temperature of the material being used	**2**
7(c)	**1 mark** for each bullet point (**max 2**) • Dynamic RAM has lower cost per unit • A fast access speed is not needed • Higher bit density // more data can be stored per chip	**2**

Question	Answer	Marks
8(a)	**1 mark** for: • To **create** a symbol table	**1**
8(b)(i)	**1 mark** for each bullet point • Data movement: e.g. LDR #50 // STO 201 • Arithmetic operation: e.g. ADD 100 // INC IX • Conditional instruction: e.g. JPE 96	**3**
8(b)(ii)	**1 mark** for each bullet point (**max 2**) Similarity: • both load the **contents** of an address into the Accumulator Difference: • direct accesses the address given by the operand whereas indexed adds the contents of IX to the operand and accesses the data at that calculated address	**2**
8(b)(iii)	**1 mark** for • Indirect (addressing) • Relative (addressing)	**1**
8(c)(i)	0000 0101	**1**
8(c)(ii)	0000 0010	**1**
8(c)(iii)	1101 0010	**1**

Question	Answer	Marks
9(a)	**One mark** for each bullet point (**max 2**) • Feedback ensures that a system operates within set criteria / constraints • ...by enabling system output to affect (subsequent) system input • ...thus allowing conditions to be automatically adjusted	**2**
9(b)	**One mark** for each reason to **max 3** to match the example given • Dedicated to one task **applied to example** • Does not require much processing power **applied to example** • Built into a larger system **applied to example** • Contains firmware that cannot be easily updated **applied to example** • The system does not have its own operating system • An embedded system must contain a processor, memory and an I/O capability // Dedicated hardware	**3**