L-Università ta' Malta

MATSEC
Examinations Board

Marking Scheme

SEC Computing

Main Session 2021

Marking schemes published by the MATSEC Examination Board are not intended to be standalone documents. They are an essential resource for markers who are subsequently monitored through a verification process to ensure consistent and accurate application of the marking scheme.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with the MATSEC Examinations Board when in doubt.

PAPER I

Question			Suggested Answer	Marks Distribution	Marks
1			Input device 1: barcode reader. Purpose: to scan the barcode of the item being purchased so that software can find the related item description and price. Input device 2: touch screen. Purpose: so that the user can select from the menu provided. Input device 3: printer. Purpose: to print the receipt. Accept keyboard, microphone and credit card reader.	1 1 1 1 1 1	6
				Total:	**6**
2	a		Dedicated System. Because it can only perform one specific task.	1 1	2
	b		Input: Water Level Sensor. Output: Water Pump.	1 1	2
	c		Data: Sensor readings. Information: Water pump switched off or on. Do not accept examples that are not related to the scenario.	1 1	2
	d	i	Analogue data is continuous, real data; whilst digital is a sample from the analogue data in the form of 1 s and 0 s. Accept any other relevant answers.		1
		ii	Advantage: Takes less storage space Disadvantage: It is not the real data and hence is of inferior quality. Accept any other relevant answers.	1 1	2
		iii	In the digital controller. Accept any other relevant answers.		1
				Total:	**10**
3			Pen drive – Secondary storage device. Accept external ssd. Do not accept USB on its own.	1 mark for name. 1 mark for secondary storage.	10
			ROM – Primary storage.		
			DVD- ROM – Secondary storage. Accept also Blu-Ray disk. Accept CD-ROM.		
			RAM – Primary storage.		
			Magnetic Tape – Secondary storage. Accept reel-to-reel tape.		
				Total:	**10**
4	a		Database is a collection of structured data about a specific situation. Accept any other relevant answers.		1
	b		Ms Access or MySQl or PostgreSQL or dBASE or Oracle, etc. Accept any other relevant answers.		1
	c		id.		1

	d		Text.		1
	e		contact_num is not a field which can be processed arithmetically. Accept any other relevant answers.		1
	f	i	Username and password. Accept any other relevant answers.		2
		ii	Presence Check for both username and password. OR Type Check for username to contain only letters and Type Check for password to contain letters, numbers and special characters. OR Length Check for username to have more than 4 characters and for password to have at least 8 characters, etc.	1 mark for each method ½ mark for validation method ½ mark for description	2
	g		The owner of the coffee shop should secure the data from being stolen/ not share the client's data. Accept any other relevant answers.		1
				Total:	**10**
5	a		Shopping is made easier from anywhere. But users should make sure that a secure transaction is made. Accept any other relevant answers.	1 1	2
	b		Electronic Fund Transfer is how the user pays for the items purchased online. Accept any other relevant answers.		1
	c		Webmaster. Develops and maintains the website. Software Developer. Develops and test the smartphone app. Accept any other relevant answers. Accept System Analyst. Do not accept System Developer and Programmer in the same answer.	1 1 1 1	4
	d		CAL. Accept any other relevant answers.		1
			CAD & CAM. Accept any other relevant answers.		1
			Navigation Systems via GPS, Galileo, etc. Accept any other relevant answers.		1
				Total:	**10**
6	a		Internet Browser - Application Software.	½ mark for software ½ mark for suitable software type	1
	b		Antivirus - System Software.		1
	c		Bootstrap Loader - System Software.		1
	d		Graphics Application/ Desktop Publisher - Application Software.		1
	e		Compression Tool - System Software.		1
				Total:	**5**
7	a	i	Direct.		½
		ii	Serial.		½

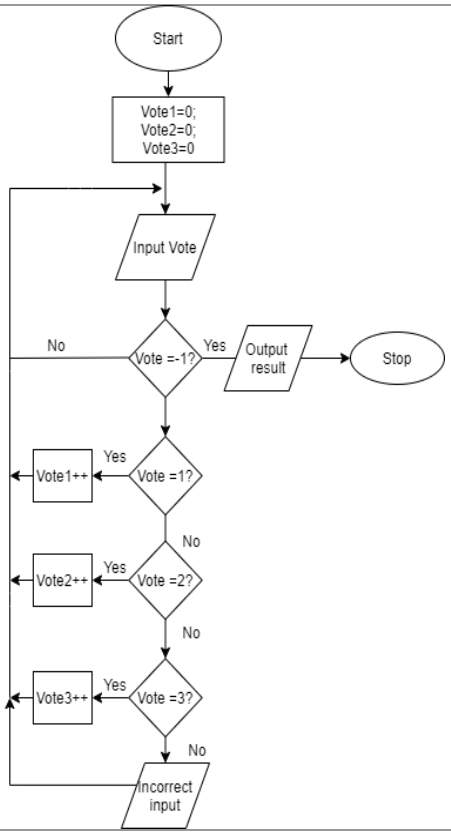
		iii	Direct.		½
		iv	Serial.		½
	b		Tape. Accept cassette, VHS, reel-to-reel.		1
	c		Antimalware scans all files one after the other and check for any files infected with a virus or any other malicious software such as Trojans, Worms, etc. Other utility software can include Backup software, Defragmenter, Scan Disk, etc. Accept any other relevant answers.	1 mark for utility 1 mark for description	2
				Total:	**5**
8	a		To be able to outline the strengths of the current system and keep them as well as highlight what is not working so that you can change/improve it.		1
	b		Interviewing. Questionnaires. Observations. Documentation study.	1 mark each for any three	3
	c		Present System Study and analysis.		1
	d		**Straight cross over (direct approach)** – complete replacements of old by the new. This can be risky. If anything is still wrong with the new system, the old system is no longer available to fall back on. **Parallel running** – old and new system run together for some time until the new one has shown it is reliable. This approach is low-risk, however keeping enough equipment and people to manage two systems at the same time can be very expensive. **Phased Change** – *over* – changing from old to new in stages. This is an expensive proposition, because the implementation is done slowly. However, it is certainly one of the least risky approaches. **Pilot Approach –** the new system is tried out in only one part of the organization. Once the system is working smoothly in that part, it is implemented throughout the rest of the organization.	1 mark each for any one correct name 1 mark each for any one correct explanation	2
				Total:	**7**
9	a		A = 182.		1
	b		255.		1
	c		8F.		1
	d		C = 01001001. D = 01110000. F = 01111001.	1 1 1	3
	e		**A** **B** **F** 0 0 1 0 1 1 1 0 1 1 1 0	Award 1 mark for each column	3
				Total:	**9**
10	a		Int number. Int total.	Award 1 mark for each	3

			Double average. Accept other variables that reflects a counter.	correct variable and data type.	
	b		Total, Average, Counter.	Award ½ mark for each correct variable initialised.	1
	c	i	The do..while loop can break on an input condition. In this case, the input part of the program continues to iterate until the value zero (0) is entered.		2
		ii	For loop - This is a count controlled loop….the number of iterations should be known beforehand.		1
				Total:	**7**
11	a		$Coins[4] = 5.$ $Coins[9] = 0.$	½ ½	1
	b	i	A logical error cannot be detected by a compiler. It is an error in the program that causes it to operate incorrectly.		1
		ii	Line 1 `i = 0;` Line 2 `do{` Line 3 `coins[i] = 0;` Line 4 `i = i + 1;` Line 5 `}` Line 6 `while (i<10); //(i<=9)`	Award 1 mark for setting i=0 Award 1 mark for changing position of the counter Award 1 mark for changing the condition to i<10 or i<=9	3
		iii	Syntax error – error in the grammar of the language. Runtime error- error that occurs during the execution of a program.	Award 1 mark for any one	1
				Total:	**6**

PAPER IIA

Question			Suggested Answer	Marks Distribution	Marks
1	a		Resource Sharing. Software Sharing. Convenient Communication. Internet Sharing.	Award 1 mark each for any two	2
	b		Wide Area Network.		1
	c		**Centralized data: All hospitals c**an share the data through the server. You can get back up, support, and other useful data from the head office and all data are synchronized with all other hospital branches. **Get updated files and data.** **A lot of application to exchange messages** by which employees can communicate with via text, voice and video chat. **Sharing of software and resources.**	Award 1 mark each for any two	2
	d		Bandwidth is measured as the amount of data that can be transferred from one point to another within a network in a specific amount of time.	1	2
			The higher the bandwidth, the faster the data transfer. This means that if you have larger bandwidth, less time is taken for data to be transmitted.	1	
	e		Example: Encrypt test result of patients since such data is very sensitive data. Reason: Encryption protects the data confidentiality as it is stored on computer systems and transmitted using the internet or other computer networks.	1 1	2
	f		Set user names and passwords for authorised users.		1
	g		Only authorised personnel are allowed into the computer area. There are often locks to rooms and machines to restrict access. The distribution of printed output of a confidential nature can be restricted. Shredders can be used to scrap it after use. Accept any other relevant answer.	1 1	2
	h		Data integrity is the overall accuracy, completeness, and consistency of data. When the integrity of data is secure, the information stored in a database will remain complete, accurate, and reliable no matter how long it's stored or how often it's accessed. Data integrity also ensures that your data is safe from any outside forces.	1 1	2
	i		Grandfather-father-son backup is a common rotation scheme for backup media, in which there are three or more backup cycles, such as daily, weekly and monthly. The daily backups are rotated on a daily basis using a FIFO system as above. The weekly backups are similarly rotated on a weekly basis, and the monthly backup on a monthly basis.		1
				Total:	**15**
2	a		0.4 GHz 400MHz x 1000	½ ½	1
	b		No. Because an IP Camera does not run a high amount of processes at any one point in time, hence no need to be equipped with high memory.	1 1	2

	c		Yes. Because whilst the ROM in a PC is mainly used to hold the bootstrap loader, the ROM in an IP Camera is also used to store the OS and other required software.	1 1	2
	d		HD video footage takes a lot of storage space and surely won't fit in the available internal storage space. An external Hard Disk, or an SD Card, or NAS or FTP Server can be used as external storage.	1 1	2
	e		No. Because it is equipped with an Ethernet NIC only.	1 1	2
	f	i	Control Bus determines whether the CPU requests a READ or a WRITE operation from/to RAM, whilst the Address Bus is used by the CPU to transfer the address of the required instruction to RAM.		1
		ii	32 bits.		1
		iii	Program Counter uses the address bus to transfer the address of the instruction required by the CPU to RAM.	1 1	2
	g		Being a dedicated system, the OS does not need to be compatible with various other devices. OR Programming the OS in assembly language allows for faster running of the OS.		1
	h	i	Opcode: LDA. Operand: #14.	½ ½	1
		ii	No. Because this instruction does not require any arithmetic or logical operation.	1 1	2
		iii	Yes. Because the actual value; i.e. 14, is being stored in the accumulator.	1 1	2
				Total:	**19**
3	a		Allocates and de-allocates memory. Ensures a program has sufficient memory to run in order to avoid clashing of programs.		2
	b		Managing Resources – These programs coordinate the computer's resources including keyboard, mouse, printer, monitor, storage devices and memory. Providing a user interface – Users interact with application programs and computer hardware through a user interface. Almost all operating systems today provide a windows-like Graphical User Interface (GUI) in which graphic objects called icons are used to represent commonly used features.	Award ½ mark for each name Award 1 mark for each relevant explanation	3
	c		Time-Sharing OS – A single computer shared between many user. Each user waited for his turn to complete its turn. Beneficial to user – There will be several applications open and working at the same time.	1 1	2
	d		Stored in the hard disk. The bootstrap loader is a small program with a single function that loads the OS into memory and allows it to being operation.	1 1	2
	e		Multiprogramming.	1	2

			It allows several programs to run concurrently in a single computer system.	1	
	f	i	Time Sharing / Online Since it allows many users to share the computer resources simultaneously by allocating **time** slots to several users simultaneously.	1 1	2
		ii	Real time Operating system Since response time is critical and can be fatal in this case.	1 1	2
				Total:	**15**
4	a		`int [] candidates_scores = new int[3];`	Award 1 mark for type Award 1 mark for declaration system	2
	b			Award 1 mark for start/stop Award 1 mark for each symbol with connections	8

	c		`int winner_index = 0;`
			`int max = 0;`
			`for (int i = 0;i<3;i++){`
			`if(candidates_scores[i] > max){`
			`  max = candidates_scores[i];`
			`  winner_index= i;`
			`}`
					5

	d		`System.out.println("The winner is candidate " + winner_index+1 + " with " +max+ "votes");`	Award 1 mark to display the winning candidate Award 1 mark to display the number of votes	2
				Total:	**17**

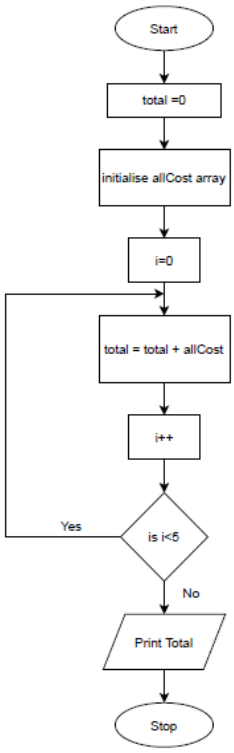
<table>
<tr><td rowspan="8">5</td><td rowspan="2">a</td><td>i</td><td>0 – 1023.</td><td></td><td>1</td></tr>
<tr><td>ii</td><td>-512 to +511.</td><td></td><td>1</td></tr>
<tr><td rowspan="3">b</td><td>i</td><td>Shift Left.</td><td></td><td>1</td></tr>
<tr><td>ii</td><td>Overflow.
10 bit register and 1 bit is lost when shifting to left so the result is not that of multiplication by 2.</td><td>1
1</td><td>2</td></tr>
<tr><td>iii</td><td>0101111100 – division.
1110001011 - after addition.</td><td>1
1</td><td>2</td></tr>
<tr><td rowspan="2">c</td><td>i</td><td><table><tr><th>A</th><th>B</th><th>Z</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table></td><td>Award ½ mark for each correct row</td><td>2</td></tr>
<tr><td>ii</td><td><table><tr><th>A</th><th>B</th><th>(A.B)’</th><th>(A.B)’’</th><th>C= A.B</th></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr></table>Figure 2 - AND gate<table><tr><th>A</th><th>B</th><th>A’</th><th>B’</th><th>C= (A’.B’)’</th></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr></table>Figure 3 - OR gate</td><td>Award 1 mark for each truth table

Award 1 mark for each single logic function obtained</td><td>4</td></tr>
<tr><td>d</td><td>i</td><td><table><tr><th>A</th><th>B</th><th>C</th><th>A’</th><th>C’</th><th>A’ NAND B</th><th>F</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</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>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr></table></td><td>Award ½ mark for each gate</td><td>4</td></tr>
<tr><td>ii</td><td>F = ((A’.B)’ . C’)’.</td><td>Award ½ mark for each gate.</td><td>2</td></tr>
<tr><td colspan="4"></td><td>Total:</td><td>19</td></tr>
</table>

PAPER IIB

Question			Suggested Answer	Marks Distribution	Marks
1	a		A LAN - Local Area Network - is a computer network that interconnects computers within a limited area such as a residence, school, laboratory, university campus or office building.		2
	b		Resource Sharing. Software Sharing. Convenient Communication. Internet Sharing.	1 mark each for any two	2
	c		Wide Area Network / WAN.		1
	d		**Centralised data:** All hospitals can share the data through the server. You can get back up, support, and other useful data from the head office and all data are synchronized with all other hospital branches. **Get updated files and data:** A lot of application to exchange messages by which employees can communicate with via text, voice and video chat.	Award 1 mark for each correct advantage.	2
	e		Freedom from wires. Easy to setup. Flexibility. Cost-effectiveness.	1 mark each for any two	2
	f		Test result of patients since such data is very sensitive data and encryption protects the data confidentiality as it is stored on computer systems and transmitted using the internet or other computer networks. Since such data is very sensitive data and encryption protects the data confidentiality, as it is stored on computer systems and transmitted using the internet or other computer networks.	Award 1 mark for example Award 1 mark for reason	2
	g		Set user names and passwords for authorised users.		1
	h		Only authorised personnel are allowed into the computer area. There are often locks to rooms and machines to restrict access. The distribution of printed output of a confidential nature can be restricted. Shredders can be used to scrap it after use.		2
	i		Data integrity is the overall accuracy, completeness, and consistency of data. When the integrity of data is secure, the information stored in a database will remain complete, accurate, and reliable no matter how long it's stored or how often it's accessed. Data integrity also ensures that your data is safe from any outside forces.		2
				Total:	**16**
2	a		400MHz.		1
	b		CU controls the flow of data between the CPU and RAM. ALU which performs arithmetic and logical operations.	2 2	4
	c		This process consists of **three stages**: **Fetching** the instruction. Decoding the instruction. **Executing** the instruction.		3

	d	i	True. True. False. True. True. True.	1 mark each	6
		ii	The program counter transfers a memory address to the RAM via the address Bus to locate the required instruction. Accept any other relevant answers.		1
		iii	The Instruction Register uses the Data Bus to get the required instruction from RAM. Accept any other relevant answers.		1
		iv	The wordlength determines the number of bits of data that the CPU can process at one go. Accept any other relevant answers.		1
	e		Because it is a dedicated system and it does not process a vast amount of data/instructions at any one point in time. Accept any other relevant answers.		1
	f		Flash Memory (Memory Cards), External Storage, FTP server, NAS Storage, etc. Accept any other relevant answers.		1
				Total:	**19**
3	a		ii, i, v, iii, iv. iii, iv, i, v, ii.	2½ 2½	5
	b	i	Memory management - An operating system creates a file structure on the computer hard drive where user data can be stored and retrieved. Accept any other relevant answers.		2
		ii	Managing Resources - These programs coordinate the computer's resources including keyboard, mouse, printer, monitor, storage devices and memory. Providing a user interface – Users interact with application programs and computer hardware through a user interface. Almost all operating systems today provide a windows-like Graphical User Interface (GUI) in which graphic objects called icons are used to represent commonly used features.	Award 1 mark for any name Award 1 mark for relevant explanation	2
	c	i	Software piracy is the act of stealing software that is legally protected. This stealing includes copying, distributing, modifying or selling the software. Software copyright is used by software developers and proprietary software companies to prevent the unauthorized copying of their software.	1 1	2
		ii	Security locks, or dongles, are hardware devices, which attach to a port on the computer. The software will check that the correct dongle is attached, and will not run if it is not. It is very difficult to copy a dongle, and so although software, which uses dongles, can be copied, it will be useless without the dongle. Dongles are expensive to produce, and easy to mislay, and so are rarely used.	1	2

			Keyword protection is frequently used with cheap software. In this protection scheme, every time the software is run it will ask you to input a word from the manual, each time a different word from a different page. Although it is quite easy to photocopy the manual, it is frequently not worth it since the software is quite cheap and the manual usually quite thick.	1	
		iii	Software is very expensive. Whilst computer hardware prices have steadily declined during the last years, software prices have remained quite stable. You are faced with a larger choice of software with which to experiment.	1 1	2
		iv	It ensures that the data held by an organisation is processed in a manner that ensures appropriate security of the personal data, including protection against unauthorised or unlawful processing and against accidental loss, destruction or damage, using appropriate technical or organisational measures. Accept any other relevant answers.		1
				Total:	**16**
4	a		An Array.		1
	b		Line 2.		1
	c		Stored as an integer.		1
	d		Total is initialised to 0 because it is a counter. Accept answers that states that total should start from 0 before it is updated.		1
	e		Line 1 – Total initialised to 0 as it is a counter. Line 2 –The array allCosts is set to the values in the {}. Line 3 – A for loop is set to loop for 5 times. Line 4 – Total is keeping the cumulative sum of the numbers stored in the array. Line 5 – Print total on screen.	Award 1 mark for each description of each line number	5
	f			Award 1 mark for each label	5

	g	i	The number at position 6 is unreachable as the for loops 5 times.		1
		ii	Line 3.		1
		iii	i < 6.		1
				Total:	**17**
5	a	i	Bit – binary digit - 1/0 – smallest unit of data in a computer.		1
		ii	Byte.		1
	b		A logic gate - A device that performs one or more logical operations on one or more input signals.		1
	c	i	AND, NOT gates.		2
		ii	**A** / **B** / **C** 0 / 0 / **1** 0 / 1 / **1** 1 / 0 / **1** 1 / 1 / **0**	Award ½ marks for each correct 0 or 1	2
		iii	**Pulses Generated** / **Counter Outputs** (**C**, **B**, **A**) / **X** / **Y** / **Z** 0 / 0 0 0 / **1** / **0** / **0** 1 / 0 0 1 / **1** / **0** / **0** 2 / 0 1 0 / **1** / **1** / **0** 3 / 0 1 1 / **0** / **1** / **0** 4 / 1 0 0 / **1** / **1** / **1** 5 / **1 0 1** / **1** / **1** / **1** 6 / **1 1 0** / **1** / **1** / **1** 7 / **1 1 1** / **0** / **1** / **1**	Award 3 marks for each of columns X and Y Award 2 marks for column Z Award 2 marks for continuation of combinations of inputs	10
				Total:	**17**