



L-Università  
ta' Malta

MATSEC  
Examinations Board



**Marking Scheme**  
SEC Computing

**Main Session 2025**

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 II****Level 1-2-3**

Question			Model Answer	Distribution of marks and clarifications	Marks
1	a	i	Line 26 <b>OR</b> Line 27 <b>OR</b> Line 35		1
		ii	Line 24		1
		iii	Line 1		1
		iv	Line 25 <b>OR</b> Line 28 <b>OR</b> Line 29 <b>OR</b> Line 30		1
		v	Line 3 <b>OR</b> Line 4 <b>OR</b> Line 5 <b>OR</b> Line 6 <b>OR</b> Line 8 <b>OR</b> Line 9 <b>OR</b> Line 10 <b>OR</b> Line 11 <b>OR</b> Line 24		1
	b	i	int servoPin = <u>11</u> ;		1
		ii	int greenLEDPin = <u>9</u> ;		1
		iii	bool		1
		iv	pinMode( <u>greenLEDPin, OUTPUT</u> );		1
		v	pinMode( <u>redLEDPin, OUTPUT</u> );		1
		vi	int            photocellValue            = analogRead( <u>photocellPin</u> );		1
		vii	digitalWrite(greenLEDPin, LOW);	1 mark for each correct line of code.  (The order of the lines of code can be different)	4
		viii	digitalWrite(redLEDPin, HIGH);		
		vix	myServo.write( <u>openAngle</u> );		
		vx	lowlight = false;		
	c		No, because it is an analogue sensor	1 mark for answering NO, and 1 mark for explanation.	2
	d		0		1
	e		Arduino includes only input analogue pins.		1
f		Debugging purposes		1	
g		Meaningful variable names, Proper code indentation, and Inline Comments	1 mark for each correct answer	3	
h		1: Trace (Display) photocell readings	1 mark for each correct answer	6	

		2: Is Low Light set to True? 3: Is Low Light set to False? 4: Switch ON Green LED 5: Switch OFF Red LED 6: Set Low Light to False		
	i	Lines 27 and 31. The variable lowLight is set to true when the photocell reading is less than the threshold. If the photocell reading remains below the threshold, the code first checks whether lowLight is already true before changing the state of the LEDs.	1 mark each 1 1	4
	j	if ((photocellValue < threshold) && (lowLight == false)) {		1
	k	Line 35: tone (13, 1000); Line 37: noTone(13);	1 mark for each correct line of code	2
	l	tone (13, 1000, 5000);		1
	m	i	int potValue = analogRead(A1);	1
		ii	10 bits ADC because the potValue readings range from 0 to 1023.	1 mark for stating 10 bits 1 mark for correct explanation
		iii	200 - 800	1
<b>Total</b>				<b>41</b>
2	a	1 mark for naming the variable 'points', and 1 mark for initialising it to 5000.		2
	b	1 mark for naming the variable 'num_of_guesses', and 1 mark for initialising it to 0.		2
	c	1 mark for naming the tuple 'valid_colours'. Award ½ if list or dictionary is initialised instead of tuple. 1 mark for populating it with 'b', 'g', 'p', 'r', 'y', 'w' (in any order and either lower or uppercase).		2
	d	1 mark for naming the variable 'secret code', 1 mark for generating 4 random colours (repeated colours accepted) from the tuple (using the random library), and 1 mark for concatenating the 4 random colours and store into variable 'secret code'.		3
	e	i	1 mark for displaying the title.	1
		ii	1 mark to display the number of guesses used, and 1 mark for displaying the available points.	2

f		1 mark for prompting and getting the user's input	1
g		1 mark for removing spaces included before and after the player's guess, and 1 mark for removing spaces includes in the player's guess.	2
h		1 mark for validating the length of the input, and 1 mark for validating that the four characters are within the tuple of available colours.	2
i		1 mark for converting the player's input to lower/uppercasse.	1
j	i	1 mark for displaying an error message.	1
	ii	1 mark for looping back to initial gameplay state (using while loop).	1
k	i	1 mark to check if guess is incorrect	1
	i (a)	1 mark for deducting 500 from variable 'points'.	1
	i (b)	1 mark for adding 1 to 'num_of_guesses'.	1
	i (c)	1 mark for comparing each character of the players' input with that of the secret code, 1 mark for storing the number of correct guessed pins in variable 'guessed positions', and 1 mark for displaying the number of guessed pins.	3
	i (d)	1 mark for checking that 10 guesses have not been used, and 1 mark for looping back.	2
	i (e)	1 mark for checking that 10 guesses have been used, 1 mark for displaying game over message, and 1 mark for revealing the secret code.	3
	ii	1 mark for checking that guess is correct, 1 mark for displaying a Congratulation message, 1 mark for displaying the final points, and 1 mark for displaying the number of guesses used.	4
l	i	1 mark for naming the function show feedback, 1 mark for accepting three arguments, and 1 mark for calling the function when needed.	3
	ii	1 mark for naming the function validate_code_input, 1 mark for accepting one argument, 1 mark for returning true or false, and 1 mark for calling the function when needed.	4
	iii	1 mark for naming the function generate_secret_code (), 1 mark for returning true or false, and 1 mark for calling the function when needed.	3

	iv	1 mark for naming the function <code>game_play ()</code> , and 1 mark for calling the function to start the game.	2	
	m	1 mark if no global variables are used.	1	
	n	1 mark if some of the variable names are given a meaningful name, OR 2 marks if all variable names are given a meaningful name. <i>* Besides the ones given in the question.</i>	2	
	o	1 mark if a few comments are used and not necessarily to help code readability and understanding, OR 2 marks if comments are intentionally done to help understanding of code.	2	
	p	1 mark if parts of code are property indented, OR 2 marks if all code is property indented.	2	
	q	i	1 mark for including carriage returns for improved readability	1
		ii	1 mark for using or borders and/or other factors to make the interface presentable and user friendly.	1
	r	1 mark if program runs without syntax, and 1 mark if program runs without runtime errors.	2	
	s	1 mark for saving with filename as indicated.	1	

**Sample Solution**

```
from random import choice
```

```
def show_feedback(guessed_positions, num_of_guesses, points):
    # Displays feedback to the player.
    print (f"Correct position guessed: {guessed_positions}")
    print ("-----")
    print (f'\nGuesses Used: { num_of_guesses} | Points Remaining: {points}')
```

```
def num_of_correct_pins(player_input, actual_code):
    pins_guessed = 0
    for i in range (4):
        if player_input [i] == actual_code[i]:
            pins_guessed += 1
    return pins_guessed
```

```
def validate_code_input(player_input):
    # Validates the player's input for length and valid colours.
    valid_colours = ("r", "g", "b", "y", "p", "w")
    if len(player_input) == 4:
        for char in player_input:
            if char not in valid_colours:
                return False
    else:
```

```
        return False
    return True

def generate_secret_code():
    # Generates a random secret code from the available colours.
    generated_code = ""
    valid_colours = ["r", "g", "b", "y", "p", "w"]
    for _ in range (4):
        generated_code += choice(valid_colours)
    return generated_code

def game_play():
    # Initialize game variables
    points = 5000
    num_of_guesses = 0
    secret_code = generate_secret_code()
    game_won = False

    # Display Intro
    print ('*****\n MASTERMIND \n*****')
    print (f'\nGuesses Used: {num_of_guesses} | Available Points:
{points}')

    #Start Gameplay Loop
    while num_of_guesses < 10 and game_won == False:
        player_input = input ("Guess the 4-colour secret code (R, G, B, Y, P, W):
")

        # Remove before and after spaces
        player_input = player_input.strip()
        # Remove spaces in String
        player_input = player_input.replace(" ", "")
        # Change to lowercase - not case sensitive
        player_input = player_input.lower()

        if validate_code_input(player_input) == False:
            print ('!! Invalid Guess !!\n')
        else:
            num_of_guesses += 1
            guessed_positions = num_of_correct_pins(player_input,
secret_code)
            if guessed_positions == 4:
                # Display Congrats Message
                print ('\n***** YOU WON *****')
                print (f'Secret Code guessed after {num_of_guesses}
guesses')

                print (f'Added Bonus Points: {bonus}')
```

```
print (f'Total Points: {points+bonus}')
print ('*****')
game_won = True
else:
    if num_of_guesses == 10:
        print ("\nGame Over! You've used all your guesses.")
        print (f"The secret code was: {secret_code}")
    else:
        points -= 500
        show_feedback(guessed_positions, num_of_guesses,
points)

# Run the game
game_play ()
```

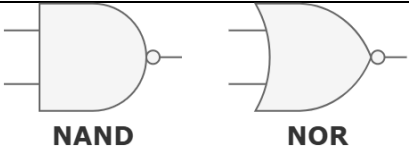
**TOTAL**

**59**

**PAPER II****Level 1-2**

Question No		Model Answer	Distribution of marks and clarifications	Marks
1	a	Networked devices enable centralized control and monitoring and can share data and resources.	1 mark for every correct advantage.	2
	b	An Embedded OS is designed for specific tasks on dedicated hardware, whereas a General-Purpose OS can run multiple applications on laptops, smartphones, etc.	1 mark providing one difference.	1
	c	GUI: Uses visuals like icons and menus. CLI: Requires users to input text commands. NUI: Uses natural interactions like voice, gestures, or touch.	1 mark for each correct difference.	3
	d	It helps recover data and system settings in case of failures, such as hardware crashes or accidental deletions.	1 mark for providing at least one correct use.	1
	e	Databases provide efficient organization of large datasets and faster data search.	1 mark for every correct mentioned advantage.	2
<b>Total</b>				<b>9</b>
2	a	The Internet of Things (IoT) refers to a network of interconnected devices that can collect, share, and act on data in real-time through the Internet.	1 mark for correct definition.	1
	b	Advantage: Ethernet provides a stable and faster connection with less interference compared to Wi-Fi. Disadvantage: Ethernet limits mobility since devices must be physically connected via cables.	1 mark correct advantage and one mark for correct disadvantage.	2
	c	Network Interface Card (NIC).		1
	d	Router.		1
	e	Wireless Access Point (WAP)		1
	f	MAC is unique hardware identifier for devices on a network, assigned by the manufacturer.	1 mark for distinguishing correctly between the addresses.	1

			IP Address is assigned to devices by the router for communication within the network.		
	g		IPv4 uses 32-bit addresses, whilst IPv6 uses 128-bit addresses.	1 mark for providing at least one correct difference.	1
<b>Total</b>					<b>8</b>
3	a		Python <input checked="" type="checkbox"/> HLL <input type="checkbox"/> LLL Assembly <input type="checkbox"/> HLL <input checked="" type="checkbox"/> LLL SQL <input checked="" type="checkbox"/> HLL <input type="checkbox"/> LLL JAVA <input checked="" type="checkbox"/> HLL <input type="checkbox"/> LLL	½ mark for each correct answer	2
	b	i	Source code is the code written by the developer and the executable code is the translated source code to machine language.		2
		ii	Assembler, Compiler and Interpreter.		3
	c		Game Interface: Application software Firmware: System software	1 mark for each correct answer	2
	d	i	A software license is a legal agreement that defines how software can be used, modified, or distributed.		1
		ii	Freeware <b>OR</b> shareware <b>OR</b> single-user <b>OR</b> site <b>OR</b> open-source licenses.		1
<b>Total</b>					<b>11</b>
4	a		Digital systems are two state devices, thus operate with two states (0 and 1).		1
	b		01000100 <sub>2</sub>	1 mark for showing the working. 1 mark for correct conversion.	2
	c	i	10001000 <sub>2</sub>		1
		ii	00010001 <sub>2</sub>	1 mark for each bit shift to the right.	2
	d	i	00000101 <sub>2</sub>	1 mark for showing working. 1 mark for correct binary addition.	2
		ii	00111101 <sub>2</sub>	1 mark for showing working. 1 mark for converting 7 to binary. 1 mark for converting 7 to negative using 2s complement. 1 mark for binary adding 68 and -7.	4
<b>Total</b>					<b>12</b>

5	a	i	Supplier, Contractor, and Project	1 mark for each correct table.	3
		ii	supervisor_id, contractor_id, and project_id	1 mark for each correct answer.	3
		iii	supervisor_id, and contractor_id	1 mark for each correct answer.	2
		iv	5426181M, BuildCo Ltd., 99456789		3
		v	SELECT name, address FROM project ORDER BY name;	1 mark for proper SELECT clause, 1 mark for proper FROM clause, and 1 mark for proper ORDER BY clause.	3
	b	i	Data validation are checks performed to ensure that data entered by the user is valid and meets certain criteria.		1
		ii	List		1
		iii	While		1
		iv	It is removing any trailing spaces before or after the string.		1
		v	The name is added to the list.		1
		vi	When the name does not contain printable characters.		1
		vii	When the name contains printable characters.		1
	c		A firewall protects the database from unauthorized or malicious access.	1 mark for each correct justification.	1
<b>Total</b>					<b>22</b>
6	a	i	RAM, and ROM	1 mark for each correct answer.	2
		ii	16 KB		1
		iii	 <p style="text-align: center;"><b>NAND</b>                      <b>NOR</b></p>	1 mark for each correct answer.	2
		iv	FAT32, and NTFS.	1 mark for each correct answer.	2
		v	Resolution: 160x128 pixels Bit-Depth: Black only <b>OR</b> 1 bit	1 mark for each correct answer.	2
		vi	The number of bits of data that the CPU can process per cycle.		1

		vii	The larger the address bus the more address space.		1
	b	i	Opcode: LOAD <b>OR</b> MUL <b>OR</b> STORE Operand: R1 <b>OR</b> R2 <b>OR</b> R3 <b>OR</b> length <b>OR</b> width <b>OR</b> area	1 mark for each correct answer	2
		ii	The Fetch and Execute cycle is the process performed by the CPU to fetching an instruction from memory, decoding it, and executing it.		1
		iii	It transfers data, instructions, and control signals between the CPU, memory, and other components during the Fetch and Execute cycle.		1
		iv	Address, Control and Data Bus	1 mark for each correct bus.	3
		v	CU fetches instructions, decodes them, and coordinates the execution process.  ALU performs any required mathematical calculations and logical operations on data.  Accumulator temporarily stores the results of calculations or operations performed by the ALU.	1 mark for each correct definition.	3
<b>Total</b>					<b>21</b>
7	a		A microcontroller is a compact, integrated circuit designed to perform specific tasks within an embedded system.		1
	b	i	A step-by-step solution of a particular task.		1
		ii	Data: raw sensor readings. Information: the thermal camera switching on or off.	1 mark for each correct answer	2
		iii	1: Get temperature sensor reading 2: Thermal Camera switched ON 3: Is motion detected? 4: Is it nighttime?	1 mark for each correct factor.	4
	c		Serial data transfer is a method of transmitting data one bit at a time over a single communication channel/wire.		1

d	i	Analogue data is continuous and represents physical quantities, such as temperature or light intensity.		1																																				
	ii	Digital data is discrete, represented in binary format (0s and 1s), suitable for processing by computers.		1																																				
	iii	ADC converts analogue signals into digital data that can be processed by a microcontroller.		1																																				
e	i	<table border="1" style="display: inline-table; vertical-align: middle;"> <thead> <tr> <th>M</th> <th>D</th> <th>C</th> <th>T</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>0</td></tr> <tr><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></tr> <tr><td>1</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td></tr> </tbody> </table>	M	D	C	T	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	0	1	0	0	1	1	0	1	1	1	1	0	0	1	1	1	1	½ mark for each correct column.	2
	M	D	C	T																																				
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ii		½ mark for each correct logic gate used, 1 mark for correct logic flow.	3																																					
<b>Total</b>				<b>17</b>																																				

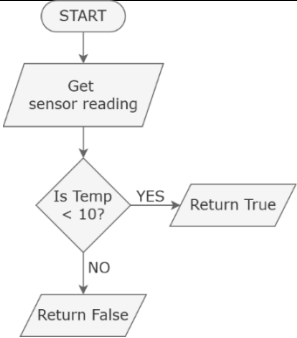
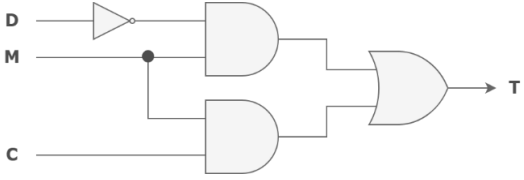
**PAPER II****Level 2-3**

Question No		Model Answer	Distribution of marks and clarifications	Marks
1	a	Networked devices enable centralized control and monitoring and can share data and resources.	1 mark for every correct advantage.	2
	b	An Embedded OS is designed for specific tasks on dedicated hardware, whereas a General-Purpose OS can run multiple applications on laptops, smartphones, etc.	1 mark providing one difference.	1
	c	GUI: Uses visuals like icons and menus. CLI: Requires users to input text commands. NUI: Uses natural interactions like voice, gestures, or touch.	1 mark for each correct difference.	3
	d	It helps recover data and system settings in case of failures, such as hardware crashes or accidental deletions.	1 mark for providing at least one correct use.	1
	e	Databases provide efficient organization of large datasets and faster data search.	1 mark for every correct mentioned advantage.	2
<b>Total</b>				<b>9</b>
2	a	The Internet of Things (IoT) refers to a network of interconnected devices that can collect, share, and act on data in real-time through the Internet.	1 mark for correct definition.	1
	b	Advantage: Ethernet provides a stable and faster connection with less interference compared to Wi-Fi. Disadvantage: Ethernet limits mobility since devices must be physically connected via cables.	1 mark correct advantage and one mark for correct disadvantage.	2
	c	Network Interface Card (NIC).		1
	d	Router.	Accept also Modem	1
	e	Wireless Access Point (WAP)	Accept also Access point (AP) or Wi-Fi Range Extender.	1
	f	MAC is unique hardware identifier for devices on a network, assigned by the manufacturer.	1 mark for distinguishing correctly between the addresses.	1

			IP Address is assigned to devices by the router for communication within the network.			
	g		IPv4 uses 32-bit addresses, whilst IPv6 uses 128-bit addresses.	1 mark for providing at least one correct difference.	1	
<b>Total</b>					<b>8</b>	
3	a		A 4GL is high-level language offering very limited freedom to build tailor made apps such as the game console's interface.		1	
	b		Assembly language provides low-level hardware control and is processed faster and more efficient.		1	
	c	i		Computers understand only executable / machine code.		1
		ii		Assembler		1
		iii		Compiler because it translates the entire source code into an executable form.	1 mark for mentioning compiler 1 mark for correct justification	2
	d		It performs specific tasks and is designed for end-users.		1	
	e	i		Users can play games without requiring significant internal storage, making it more accessible for devices with limited space.		1
ii			Shareware license because it allows users to try a limited selection of games for free, encouraging them to purchase a license for the full collection.	1 mark for shareware license 1 mark for justification	2	
<b>Total</b>					<b>10</b>	
4	a		Digital systems are two state devices, thus operate with two states (0 and 1).		1	
	b		01000100 <sub>2</sub>	1 mark for showing the working. 1 mark for correct conversion.	2	
	c	i		10001000 <sub>2</sub>		1
		ii		00100010 <sub>2</sub>		1
	d		Zooming up to 4 times requires left shifting twice, resulting in a numerical overflow.		1	
	e	i		00000101 <sub>2</sub>	1 mark for showing working.	2

			1 mark for correct binary addition.		
		ii	00111101 <sub>2</sub>	1 mark for showing working. 1 mark for converting 7 to binary. 1 mark for converting 7 to negative using 2s complement. 1 mark for binary adding 68 and -7.	4
	f		A Half Adder can only add two single-bit binary numbers and does not cater for carry inputs.		1
<b>Total</b>					<b>13</b>
5	a	i	A database is required to efficiently store, organize, and retrieve data, have data integrity and allowing multiple users to access and update records simultaneously.		1
		ii	supervisor_id and contractor_id	1 mark for each correct foreign key.	2
		iii	No, because every project must have one and only one contractor working on it.	1 mark for stating 'NO', and 1 mark for justification.	2
	b	i	String	Award ½ mark for TEXT	1
		ii	Tuple		1
		iii	id[:7] extracts the first 7 characters of the string, whilst id[7] extracts the 8th character of the string.		1
		iv	Convert last character (id[7]) to uppercase.		1
		v	Lines: 3, 4, and 5		1
		vi	Include multiple criteria in one if statement.		1
	c		Name cannot be left empty and contact number must be 8 digits long.	1 mark for each valid validation check.	2
	d		A multi-tasking OS allows multiple processes to run concurrently, whilst a single-tasking OS can only handle one process at a time.		1
	e	i	5426181M, BuildCo Ltd., 68456789	1 mark for each correctly provided attribute.	3
		ii	SELECT name, address FROM project ORDER BY name;	1 mark for proper SELECT clause, 1 mark for proper FROM clause, 1 proper ORDER BY clause.	3

	f		A firewall protects the database from unauthorized or malicious access, and HTTPS connection encrypts data transmitted between the user and the server.	1 mark for each correct justification.	2	
<b>Total</b>					<b>22</b>	
6	a	i	ROM is non-volatile, whilst RAM is volatile.	1 mark for each explanation	2	
		ii	Universal gates simplify circuit design and reduce costs.		1	
		iii	Yes, because a 32-bit CPU handles larger data and instructions per CPU cycle.	1 mark for indicating that the device CPU performs better, and 1 mark for justification.	2	
		iv	An 8-bit address bus can address 256 bytes. It cannot support the 18 KB RAM required for the OS.	1 mark for indicating that OS would not be able to run 1 mark for justification.	2	
	b		Defines operations the CPU can execute.		1	
	c	i		Calculates the area and stores the result.		1
		ii		Control Unit		1
		iii		Data Bus		1
		iv		Arithmetic and Logic Unit (ALU)		1
		v		R3 because it is temporarily storing the result.	1 mark for correctly indicating register R3, and 1 mark for justification.	2
		vi		Write signal		1
		vii		length, width, result.	1 mark for each correct variable.	3
	<b>Total</b>					<b>18</b>
7	a		Microcontrollers are compact, cost-effective, and consume less power compared to System-on-Chip (SoC) technology, making them ideal for single-task systems like this.		1	
	b		Parallel data transfer requires multiple data lines, which increase complexity and cost.		1	
	c	i	Analogue data is continuous and variable, while digital data is discrete and represented as binary (0s and 1s).		1	

	ii	A 10-bit ADC requires less memory and processing power and provides sufficient resolution for this application.	1 mark for each correct factor.	2																																				
d	i	Line 1		1																																				
	ii	Issue with indentation in lines 3, 5 and 7	1 mark for mentioning the indentation problem 1 mark for identifying the lines causing this error.	2																																				
	iii	read_PIR_Sensor() <b>OR</b> check_light_sensor() <b>OR</b> check_temp_sensor()		1																																				
	iv	thermal_camera()		1																																				
	v		½ mark for correct input, 1 mark for correct decision (including Yes/No indicators), ½ mark for each correct return value.	3																																				
e	i	<table border="1" data-bbox="300 1115 699 1462"> <thead> <tr> <th>M</th> <th>D</th> <th>C</th> <th>T</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>0</td></tr> <tr><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></tr> <tr><td>1</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td></tr> </tbody> </table>	M	D	C	T	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	0	1	0	0	1	1	0	1	1	1	1	0	0	1	1	1	1	½ mark for each correct column.	2
	M	D	C	T																																				
	0	0	0	0																																				
0	0	1	0																																					
0	1	0	0																																					
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1	1	0	0																																					
1	1	1	1																																					
ii		½ mark for each correct logic gate used, ½ mark for correctly indicating all inputs, ½ mark for correctly indicating the output, 1 mark for correct logic flow.	4																																					
iii	$T = (M \cdot \bar{D}) + (M \cdot C)$		1																																					
<b>Total</b>				<b>20</b>																																				