COMMONWEALTH SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2020
COMPUTING
Paper 1 (Theory)
Sec 4 E/4NA

Mark Scheme

<table>
<tr><th>Qn</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1</td><td>
<table>
<tr><th>Statement</th><th>Register</th><th>Main Memory</th><th>Secondary Storage</th></tr>
<tr><td>Data is lost during power interruption</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>Non-volatile memory</td><td></td><td></td><td>✓</td></tr>
<tr><td>Slowest accessing speed</td><td></td><td></td><td>✓</td></tr>
<tr><td>Storage space directly used by the arithmetic logic unit and the control unit</td><td>✓</td><td></td><td></td></tr>
<tr><td>Used to transfer large amounts of data from one device to another</td><td></td><td></td><td>✓</td></tr>
</table>
</td><td></td></tr>
<tr><td>2</td><td>
Licence — Description
Free and Open Source — Software that is free for use for a period after which users will need to pay a fee to continue to use it.
Public Domain — Software where unauthorised copying of it is prohibited and its source code is kept secret.
Freeware — Software that is available as “lite” version where users may use at no cost.
Shareware — Software that is available for users to use, copy, study and modify.
Proprietary — For intellectual property that have expired or simply surrendered.
</td><td></td></tr>
<tr><td>3 (a) (i)</td><td>$89_{10} = 64_{10} + 16_{10} + 8_{10} + 1_{10}$
$= 2^6 + 2^4 + 2^3 + 2^0$
$= 01011001_2$</td><td></td></tr>
<tr><td>3 (a) (ii)</td><td>$9_{10} = 1001_2$ and $B_{16} = 1011_2$

Thus, $9B_{16} = 1001\ 1011_2$
$= 128_{10} + 16_{10} + 8_{10} + 2_{10} + 1_{10}$
$= 155_{10}$

$9B_{16} = 16 \times 9 + 11$
$= 155_{10}$</td><td>1</td></tr>
</table>

Qn	Answer	Marks
3 (a) (iii)	$1110_2 = 8 + 4 + 2 = 14_{10} = E_{16}$ and $0101_2 = 4 + 1 = 5_{10} = 5_{16}$ Thus, $11100101_2 = E5_{16}$	
3 (b) (i)	Unicode can encode more characters of different languages than ASCII.	
3 (b) (ii)	RGB colour codes, memory dumps, network address, ASCII and Unicode, URL Encoding **(Any <u>TWO</u>)**	
4	Wired: Network devices are connected by a physical medium such as cables. Wireless: Signals are transmitted in the form of electromagnetic waves such as radio waves and microwaves. Wired: Less convenient when expansion required as additional wiring will be needed. Wireless: Network can be expanded easily with existing equipment. Wired: Less convenient to use as equipment needs to be connected by cables at all time. Wireless: More convenient as one can work from any location within the wireless network's coverage area. **(Any <u>TWO</u>)**	
5 (a) (i)	1. Technology and software have been able to **<u>reduce the time, cost and effort</u>** needed for payments, investments, fundraising, trading and/or data analytics for both business and individuals. 2. Algorithmic trading which is the study and refinement of algorithms to make trading decisions at speed not possible by human being **<u>can generate profits at a speed and frequency that is impossible for a human trader</u>**. 3. Artificial intelligence can be used to **<u>calculate interest rates and home values by using historical pricing charts to develop a model that more accurately predicts the financial future</u>** by taking numerous factors into account. 4. As computers can handle large volumes of information, they can **<u>take over the manual work of analyzing data and creating meaningful reports</u>** and so will be **<u>more efficient in tasks such as detecting and preventing fraud</u>**.	

Qn	Answer	Marks
	5. The use of software and technology allows for easier communication and collaboration among employees in the financial sector which in turn results in the **generation of more profit for the financial institutions**. **(ANY TWO)** ***(Marks to be awarded if key phrases (bold and underlined) are used.)***	
5 (a) (ii)	**1.** Cyberattacks and ease of obtaining false information on the Internet has **made some people more vulnerable to financial scams and other get-rich-quick schemes.** 2. Cyberattacks such as **phishing and pharming** can result in **money loss or fraudulent activities**. 3. Technology has replaced huge number of jobs in the financial sector. As such, **many workers in the financial sector have lost their jobs**. 4. Data stored in database of financial institutions such as banks may be **corrupted, hacked or lost**. This can result in **loss of important data or data leakage**. 5. **Over-dependence on technology** can lead to banking activities coming to a standstill during **power outage** or **cyberattack such as denial-of-service**. **(ANY TWO)** ***(Marks to be awarded if key words/phrases (bold and underlined) are used.)***	
5 (b) (i)	1. Human error **Accidental damage to storage device** can happen during transportation. **Accidental overwriting of data** can happen when multiple users are working on the same file. 2. Power Failure Data can be lost when **power supply is interrupted during the process of writing** from the volatile memory (e.g. RAM) onto the non-volatile storage device (e.g. hard disk) 3. Hardware failure or damage Storage device can fail due to **overuse, manufacturing defects or damage**. 4. Malicious software or viruses	

<table>
<tr><th>Qn</th><th>Answer</th><th>Marks</th></tr>
<tr><td></td><td><u>Malicious software or viruses</u> may damage or corrupt data.

(ANY <u>ONE</u>)

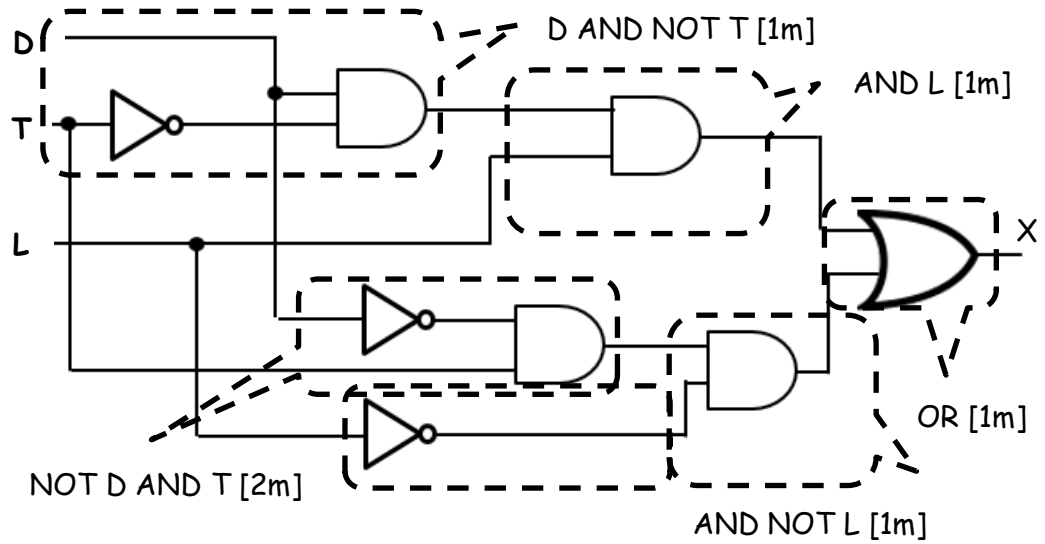
(Marks to be awarded if key words/phrases (bold and underlined) are used.)</td><td></td></tr>
<tr><td>5 (b) (ii)</td><td>1. Make <u>regular backups of data</u>
2. Use <u>adequate protection when handling/transporting</u> storage devices.
3. <u>Set up rules when collaborating</u> so as to prevent accidental overwriting of data.
4. Use <u>backup power supply or UPS (Uninterruptible Power Supply)</u> so that the storage device can complete the writing of data in case of power failures.
5. <u>Check storage devices regularly and replace</u> them immediately when signs of failure are detected.
6. <u>Install anti-virus and perform regular scans</u> for viruses.
7. Avoid opening <u>emails from unknown sources/suspicious web links.</u>

(ANY <u>ONE</u>)

(Marks to be awarded if key words/phrases (bold and underlined) are used.)</td><td></td></tr>
<tr><td>6 (a)</td><td>Inputs:
- Name of the required primary school
- A list of student names together with the name of their primary school

Outputs:
- Name of students from that primary school
- Number of students from that primary school

Processes required:
- Search for all students from that primary school
- Count the number of students who are from that primary school</td><td></td></tr>
<tr><td>7 (a)</td><td>NOR</td><td></td></tr>
<tr><td>7 (b)</td><td><table><tr><th>A</th><th>B</th><th>X</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></td></tr>
</table>

<table>
<tr><th>Qn</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7
(c)</td><td> 

X = (D AND NOT T AND L) OR (NOT D AND T AND NOT L)</td><td></td></tr>
<tr><td>8
(a)</td><td>num1 = 10
num2 = 20
(Any values such that num1 < num2)</td><td></td></tr>
<tr><td>8
(b)
(i)</td><td>
<table>
<tr><th>num1</th><th>num2</th><th>OUTPUT</th></tr>
<tr><td></td><td></td><td>“Enter first number”</td></tr>
<tr><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>“Enter second number”</td></tr>
<tr><td></td><td>10</td><td></td></tr>
<tr><td></td><td></td><td>“Enter first number”</td></tr>
<tr><td>20</td><td></td><td></td></tr>
<tr><td></td><td></td><td>“Enter second number”</td></tr>
<tr><td></td><td>5</td><td></td></tr>
<tr><td></td><td></td><td>TRUE</td></tr>
</table>
</td><td></td></tr>
<tr><td>8
(b)
(ii)</td><td>The algorithm checks if num1 is divisible by num2.
(optional: It will display TRUE if num1 is divisible by num2 and display FALSE if num1 is not divisible by num2.)</td><td></td></tr>
<tr><td>8
(c)
(i)</td><td>Name of validation check: Presence check
Description: To check that the user has entered a value for each input, num1 and num2.
Name of validation check: Format check
Description: To check that the user has entered only numbers for each input, num1 and num2
(ANY <u>ONE</u>)</td><td>1 for name

1 for description</td></tr>
<tr><td>8
(d)</td><td>
<table>
<tr><th>Test case condition</th><th>Test data</th></tr>
<tr><td>Normal condition</td><td>20, 2</td></tr>
<tr><td>Error condition</td><td>a, b</td></tr>
</table>
</td><td></td></tr>
</table>

9 (a)	**Advantage:** • Program runs at a **faster** speed as translation has been done beforehand. • Compiler is **not required** to run the program after compilation is complete. Syntax errors are detected **before** program is run. **(Any <u>ONE</u>)** **Disadvantage:** • Changes to source code require recompilation before taking effect. • Does not offer interactive mode. **(Any <u>ONE</u>)**	
9 (b)	Python, Scratch **(Any <u>ONE</u>)**	
10 (a)	**A5:** Text **B2:** Percentage **E9:** Currency	
10 (b) (i)	PPMT	
10 (b) (ii) (a)	SUM	
10 (b) (ii) (b)	B9	
11	- Initialisation of three counters for highest score (highest), highest score index (h_index) and total score of all students (total) [before loop] - Loop management for reading scores of 20 students - Input and store in list scores of 20 students (at start of loop) - Validate scores (within 0 and 100) - Totalling all students' scores - Checking for highest score… - … updating highest score if highest score is found - … updating highest score index if highest score is found - Calculating average score of all students (outside of loop) - Outputting average score of all students (outside of loop) - Outputting index of highest score (outside of loop)	

	Sample pseudo-code:
	`highest, h_index, total = 0, 0, 0`
	`FOR x = 0 TO 19`
	`    REPEAT`
	`        INPUT score[x]`
	`    UNTIL (score[x]>=0) and (score[x]<=100)`
	`    total = total + score[x]`
	`    IF score[x] > highest`
	`        highest = score[x]`
	`        h_index = x`
	`    ENDIF`
	`NEXT`
	`avg = total / 20`
	`OUTPUT avg`
	`OUTPUT h_index`	

12	**Error 1:** times = 1 **Correction:** times = 0 **Error 2:** INPUT words[times] **Correction:** INPUT words[x] **Error 3:** times = times – 1 **Correction:** times = times + 1 **Error 4:** IF times >= 0 **Correction:** IF times > 0	

13 **Sample Flowchart**

Total = 7