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6089416953

COMPUTER SCIENCE **0478/12**

Paper 1 Theory **February/March 2020**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].
- No marks will be awarded for using brand names of software packages or hardware.

This document has **12** pages. Blank pages are indicated.

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1 The Von Neumann model for a computer system uses components, such as registers and buses, in the fetch-execute cycle.

(a) Draw a line to connect each component to its correct description.

Component	Description
Control Bus	Increments to point to the address of the next instruction to be fetched
Program Counter (PC)	Holds the result of a calculation. It is located within the Arithmetic Logic Unit (ALU)
Memory Data Register (MDR)	Carries signals to synchronise the fetch-execute cycle
Accumulator (ACC)	Temporary storage between the Central Processing Unit (CPU) and primary memory

[3]

(b) State **two** buses, other than the control bus, used in the Von Neumann model for a computer system.

1 .....

2 .....

[2]

2 A school network is used to transmit and store data about students.

(a) Different types and methods of transmission can be used to send data across the network.

Three descriptions about data transmission are given.

Tick (✓) **one Method** and tick (✓) **one Type** for each description.

Description	Method		Type		
	Serial (✓)	**Parallel (✓)**	**Simplex (✓)**	**Half-duplex (✓)**	**Duplex (✓)**
Data is sent down a single wire in a single direction only.					
Data is sent down multiple wires in both directions, at the same time.					
Data is sent down a single wire in both directions, but never at the same time.					

[3]

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(b) Parity bits are used to help detect errors in data transmission. A parity bit is added to each binary value before transmission.

Three binary values are to be transmitted using **even** parity.

(i) Complete the parity bit that would be added to each binary value for even parity.

Binary value							Parity bit
1	1	0	0	1	1	1	
1	0	1	0	1	0	1	
0	1	1	0	1	0	0	

[3]

(ii) A number of errors occurred during data transmission.

State why a parity check may **not** detect transmission errors.

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..... [1]

(c) Data is encrypted using 128-bit symmetric encryption before it is transmitted.

(i) Explain what is meant by encryption.

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..... [2]

(ii) State how the strength of the encryption can be improved.

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..... [1]

(d) Describe how the school could prevent the loss of stored data.

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..... [6]

3 Priya studies music at school. She is buying a new computer to complete her school work at home.

(a) Priya has a choice between an internal Hard Disk Drive (HDD) and an internal Solid State Drive (SSD) to store data.

(i) Give **one** similarity between an HDD and an SSD.

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..... [1]

(ii) Explain **three** differences between an HDD and an SSD.

1 .....

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2 .....

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3 .....

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[3]

(b) Priya needs to transfer files between the school and her home computer.

Identify **one** off-line storage device she could use to transport the files.

..... [1]

(c) Priya is using sound editing software to record and edit different music tracks.

(i) Identify **two** input devices she would use for this task.

Device 1 .....

Device 2 .....
[2]

(ii) Identify **two** output devices she would use for this task.

Device 1 .....

Device 2 .....
[2]

(d) Priya shares her sound files with other students. Before sharing the sound files, she compresses the files using lossless compression.

Describe how lossless compression reduces the size of a sound file.

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..... [2]

(e) Priya currently uses MIDI files to store her music. Priya's friends have asked her if they can have an MP3 version of the file.

(i) Give **two** features of a MIDI file.

1 .....

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2 .....

.....
[2]

(ii) Give **two** features of an MP3 file.

1 .....

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2 .....

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[2]

4 Assemblers, compilers and interpreters are types of translators.

Tick (✓) to show which statements apply to each translator. Each statement may apply to more than one type of translator.

Statement	Assembler (✓)	Compiler (✓)	Interpreter (✓)
Translates low-level language to machine code			
Translates high-level language to machine code			
Produces error messages			
Translates high-level language one line at a time			
Produces an executable file			

[5]

5 Programmers can use denary and hexadecimal values. These values are stored in a computer system using binary.

(a) Explain why binary is used to store data in a computer system.

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..... [2]

(b) Complete the table to show how the denary value would be stored as binary in an 8-bit register.

Denary value	8-bit register
129	
56	

[2]

Working space

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(c) Complete the table to show how the hexadecimal value **3A9** would be stored as binary in a 12-bit register.

[3]

(d) Identify **two** uses of hexadecimal values in computer science.

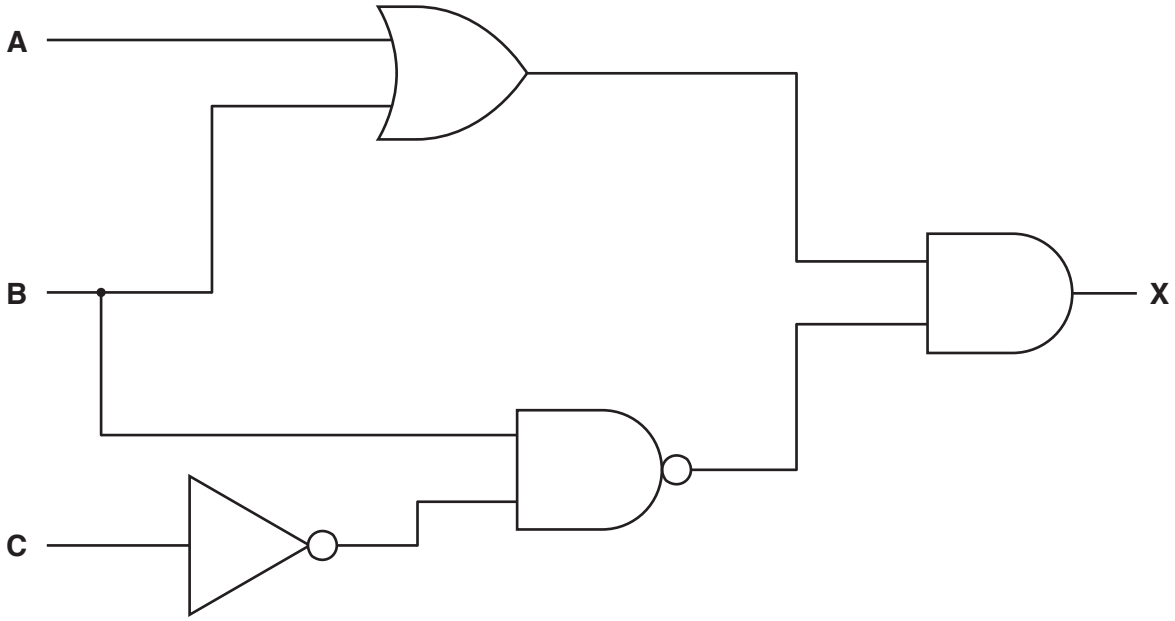
1 .....

2 .....

[2]

6 **(a)** Complete the truth table for the given logic circuit.

Do **not** attempt to simplify the logic circuit.



A	B	C	Working space	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

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(b) A water control system uses a switch and two pressure sensors.

The outputs of the switch and sensors are shown in the table.

Sensor or Switch	Output of 1	Output of 0
Switch (**S1**)	On	Off
Pressure Sensor (**P1**)	>= 3	< 3
Pressure Sensor (**P2**)	>= 3	< 3

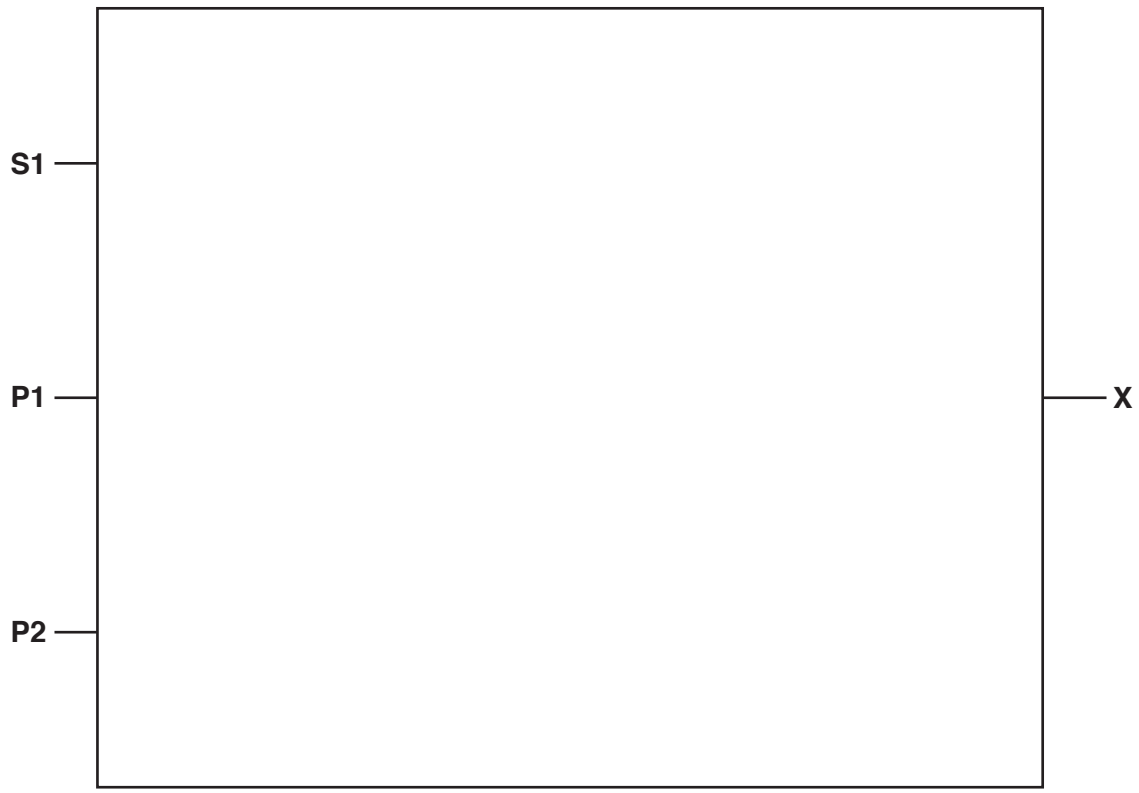
Create a logic circuit that will produce an output (**X**) of 1 when:

The switch **S1** is on

and

either P1 is less than 3 **or P2** is less than 3, **but not both**.

All logic gates used must have a maximum of two inputs.



[4]

7 A room has an automatic lighting system. Electric lights are automatically turned on when a person enters the room and the natural light level in the room is 10 or less.

Explain how sensors and a microprocessor are used to control the electric lights in the room.

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..... [7]

8 A student website provides research support and software downloads.

(a) Students use a browser to access the web pages. Explain the role of a browser in this process.

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..... [5]

(b) The website owners are worried about a denial of service (DoS) attack.

Explain the term denial of service attack.

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..... [3]

(c) The website owners are also concerned about the ethical issues of copyright and plagiarism.

(i) State what is meant by the term copyright.

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..... [1]

(ii) State what is meant by the term plagiarism.

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..... [1]

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