1 Computers store data in binary form.

(a) State the difference between a tebibyte and a terabyte.

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..... [1]

(b) Convert the signed denary value –100 into an 8-bit two's complement binary integer.

Working .....

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Answer ..... [1]

(c) Convert the denary number 251 into hexadecimal. Show your working.

Working .....

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Answer .....

[2]

(d) Add the following unsigned binary integers.

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  0 1 0 1 0 0 0 0
+ 0 0 1 1 1 1 1 0
```

[1]

2 A computer has hardware and software.

(a) The hardware includes different types of memory.

(i) Complete the description of computer memory.

Random Access Memory (RAM) and Read Only Memory (ROM) are both examples of

..... memory.

One item that is stored in RAM is ..... .

One item that is stored in ROM is ..... .

RAM can be either Static RAM (SRAM) or Dynamic RAM (DRAM).

SRAM uses transistors arranged as ..... .

DRAM uses transistors and ..... .

[5]

(ii) Explain the difference between Programmable ROM (PROM), Erasable Programmable ROM (EPROM) and Electrically Erasable Programmable ROM (EEPROM).

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..... [3]

(b) A magnetic hard disk is used to store data on the computer.

Describe the principal operations of a magnetic hard disk.

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..... [5]

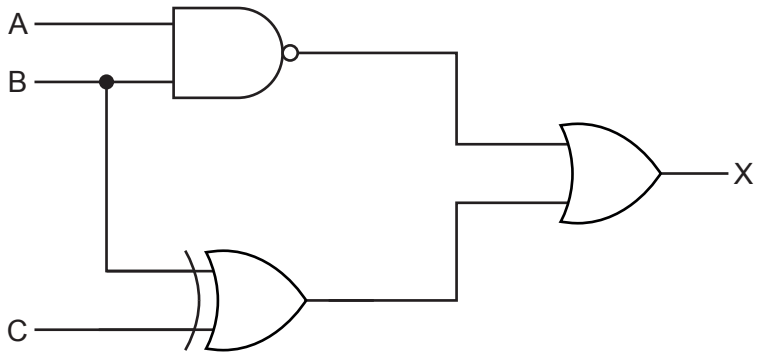
(c) Computers consist of logic gates.

(i) Complete the table by writing **one** set of values (input 1 and input 2) for each gate that will give the output 1.

Gate	Input 1	Input 2	Output
AND			1
NAND			1
XOR			1
NOR			1

[4]

(ii) Write the logic expression for the given logic circuit.



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..... [3]

3 A teacher is writing examination papers on a laptop computer. The computer is connected to the internet. The teacher is concerned about the security and privacy of the papers.

(a) State the difference between the security of data and the privacy of data.

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..... [1]

(b) Identify **and** describe **two** threats to the data. Identify **one** security measure to protect against each threat. Each security measure must be different.

Threat 1 .....

Description .....

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Security measure .....

Threat 2 .....

Description .....

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Security measure .....

[6]

4 A teacher uses a relational database, MARKS, to store data about students and their test marks.

The database has the following structure:

STUDENT(StudentID, FirstName, LastName)

TEST(TestID, Description, TotalMarks)

STUDENT_TEST(StudentID, TestID, Mark)

(a) Describe the advantages of using a relational database compared to a file-based approach.

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..... [4]

(b) Give the highest level of Normal Form (NF) the database MARKS is in **and** justify your choice.

Normal Form .....

Justification .....

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[3]

(c) (i) Sample data to be stored in the table `STUDENT_TEST` is shown.

StudentID	TestID	Mark
12	A1	50
12	P10	100
13	A1	75
14	P10	60

Write a Structured Query Language (SQL) script to create the table `STUDENT_TEST`.

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(ii) Write a Structured Query Language (SQL) script to find the average mark of students in test A7.

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(d) The mark a student is awarded in a test will be entered into the database. This mark needs to be a whole number between 0 and the maximum number of marks for that test (inclusive).

Explain how data validation **and** data verification can be used when a mark is entered.

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5 A programmer uses an Integrated Development Environment (IDE) to develop a program.

(a) Draw **one** line from each IDE feature to its correct description.

IDE feature	Description
Context-sensitive prompt	Executes one line of the program and then stops
Dynamic syntax check	Underlines or highlights statements that do not meet the rules of the language
Breakpoint	Outputs the contents of variables and data structures
Single stepping	Stops the code executing at a set line
Report window	Displays predictions of the code being entered

[4]

(b) The programmer wants to allow users to edit, improve and redistribute the program.

Identify **two** different types of software licence that the programmer could use.

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[2]

(c) Explain the benefits to the programmer of using program libraries.

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6 **(a)** A computer system is designed using the basic Von Neumann model.

(i) Describe the role of the registers in the Fetch-Execute (F-E) cycle.

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..... [5]

(ii) Describe when interrupts are detected in the F-E cycle **and** how the interrupts are handled.

Detected .....

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Handled .....

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[5]

(b) Identify **one** factor that can affect the performance of the computer system **and** state how it impacts the performance.

Factor .....

Impact .....

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[2]

(c) The table shows part of the instruction set for a processor. The processor has one general purpose register, the Accumulator (ACC).

Instruction		Explanation
Opcode	**Operand**	
`AND`	`#n`	Bitwise AND operation of the contents of ACC with the operand
`XOR`	`#n`	Bitwise XOR operation of the contents of ACC with the operand
`OR`	`#n`	Bitwise OR operation of the contents of ACC with the operand
`LSL`	`#n`	Bits in ACC are shifted logically n places to the left. Zeros are introduced on the right hand end
`LSR`	`#n`	Bits in ACC are shifted logically n places to the right. Zeros are introduced on the left hand end
# denotes a denary number, e.g. #123		

(i) Complete the register to show the result **after** the instruction `AND #2` is executed.

Register before:	0	1	1	0	1	1	0	1
Register after:								

[1]

(ii) Complete the register to show the result **after** the instruction `OR #8` is executed.

Register before:	0	1	1	0	1	1	0	1
Register after:								

[1]

(iii) Complete the register to show the result **after** the operation `LSL #4` is executed.

Register before:	0	1	1	0	1	1	0	1
Register after:								

[1]