QUESTION 1.

4 **(a)** Four descriptions and four types of computer architecture are shown below.

Draw a line to connect each description to the appropriate type of computer archi

Description	Computer archite
A computer that does not have the ability for parallel processing.	SIMD
The processor has several ALUs. Each ALU executes the same instruction but on different data.	MISD
There are several processors. Each processor executes different instructions drawn from a common pool. Each processor operates on different data drawn from a common pool.	SISD
There is only one processor executing one set of instructions on a single set of data.	MIMD

[4]

(b) In a massively parallel computer explain what is meant by:

(i) Massive .....

.....

.....[1]

(ii) Parallel .....

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.....[1]

(c) There are both hardware and software issues that have to be considered for parallel processing to succeed.

Describe **one** hardware and **one** software issue.

Hardware .....

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Software .....

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[4]

QUESTION 2.

2 **(a)** The following diagram shows four descriptions and four types of computer architecture.

Draw lines to connect each description to the appropriate computer architecture.

Description	**Computer architecture**
Most parallel computer systems use this architecture.	SIMD
Widely used to process 3D graphics in video games.	MIMD
A microprocessor is used to control a washing machine.	MISD
There are a number of processing units. Each processing unit executes the same instruction but on different data.	SISD

[4]

(b) A computer has a single processor that contains four processing units.

Explain why this is **not** an example of a massively parallel computer.

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..... [2]

(c) An application has previously executed on a single computer. The application will be transferred onto a massively parallel computer.

The program code used in the application will need to be updated to ensure that the power of the massively parallel computer is fully used.

Explain what changes will be required to the program code.

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..... [2]

(d) Explain **one** of the hardware issues that will have to be overcome if a massively parallel computer is to function successfully.

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..... [2]

QUESTION 3.

[1]

5 **(a)** Most desktop or laptop computers use CISC (Complex Instruction Set Computing) architecture. Most smartphones and tablets use RISC (Reduced Instruction Set Computing).

State **four** features that are different for the CISC and RISC architectures.

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2 .....

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3 .....

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4 .....

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[4]

(b) In a RISC processor, four instructions (**A**, **B**, **C**, **D**) are processed using pipel

The following table shows five stages that take place when instructions are fe executed. In time interval **1**, instruction **A** has been fetched.

(i) In the table, write the instruction labels (**A**, **B**, **C**, **D**) in the correct time interval for ea stage. Each operation only takes one time interval.

Stage	Time interval								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Fetch instruction	**A**								
Decode instruction									
Execute instruction									
Access operand in memory									
Write result to register									

[3]

(ii) When completed, the table in **part (b)(i)** shows how pipelining allows instructions to be carried out more rapidly. Each time interval represents one clock cycle.

Calculate how many clock cycles are saved by using pipelining in the example in **part (b)(i)**.

Show your working.

Working .....

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Answer .....

[3]

(c) The table shows four statements about computer architecture.

Put a tick (✓) in each row to identify the computer architecture associated with each

Statement	Architecture		
	SIMD	**MIMD**	**SISD**
Each processor executes a different instruction			
There is only one processor			
Each processor executes the same instruction input using data available in the dedicated memory			
Each processor typically has its own partition within a shared memory			

QUESTION 4.

7 **(a)** RISC (Reduced Instruction Set Computing) and CISC (Complex Instruction
are two types of processor.

Tick (✓) **one** box in each row to show if the statement applies to RISC or CISC proce

Statement	RISC	CISC
Larger instruction set		
Variable length instructions		
Smaller number of instruction formats		
Pipelining is easier		
Microprogrammed control unit		
Multi-cycle instructions		

[3]

(b) In parallel processing, a computer can have multiple processors running in parallel.

(i) State the **four** basic computer architectures used in parallel processing.

1 .....

2 .....

3 .....

4 .....

[4]

(ii) Describe what is meant by a **massively parallel computer**.

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..... [3]

QUESTION 5.

9 **(a)** The following incomplete table shows descriptions relating to computer archi

Complete the table by inserting the appropriate terms.

	Description	Term
A	• There are several processors. • Each processor executes different sets of instructions on one set of data at the same time.	.....
B	• The processor has several ALUs. • Each ALU executes the same set of instructions on different sets of data at the same time.	.....
C	• There is only one processor. • The processor executes one set of instructions on one set of data.	.....
D	• There are several processors. • Each processor executes a different set of instructions. • Each processor operates on different sets of data.	.....

[4]

(b) State **three** characteristics of massively parallel computers.

1 .....

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2 .....

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3 .....

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[3]

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