Unit 1: Components of a Computer
(1b. Types of Processors, A Level Only Content)
Marks: /19

Answer **all** the questions.

1.   An architect firm specialises in designing skyscrapers.

The firm uses high end computers with high performance CPUs, GPUs and large amounts of RAM.

  (i) Give one use the firm might have for GPUs.

---[1]

(ii) Describe what is meant by the term 'RAM'.

---[2]

(iii) State **one** characteristic a high performance CPU might have.

---[1]

2.   A gaming company decides to release a new video games console. The console will use a modified version of an operating system called Linux.

As well as a CPU the console contains a GPU for 3D graphics. Explain why a GPU is more suitable than a CPU for this task.

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[3]

3. *Some problems require a large amount of computing power that goes well beyond a single CPU.

Discuss the different approaches that can be taken to provide increasingly larger amounts of computing power and the types of problem they are suited to.

---[12]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1		i	To render models of proposed buildings. (1) Run CAD software. (1) Run modelling calculations. (1) Any example sensible to scenario. (1) (Max 1)	1 (AO2.1)	**Examiner's Comments** Some candidates did not apply the use of GPU to the scenario. Those who did, generally gained full marks for this question.
		ii	Random Access Memory (1) A form of primary memory (1) Used to hold data and / or programs <u>in use</u> (1) Volatile / Loses its contents when power is lost. (1) (Max 2)	2 (AO1.1)	
		iii	Multiple Cores (1) High / Fast Clock Speed (1) Ability to use pipelining (1) Large Cache (1) (Max 1)	1 (AO1.1)	Accept concurrency / parallel processing for pipelining
			Total	**4**	
2			• CPUs are general purpose processors (1) whereas GPUs are designed specifically for graphics (1). And so likely to have built in circuitry / instructions for common graphics operations (1). GPUs are able to perform an instruction on multiple pieces of data at one time (1) often we want to do this when processing graphics (e.g. transforming points in a polygon or shading pixels) (1) which means it can perform transformations to onscreen graphics quicker than a CPU (1).	3	Up to 3 marks for a valid explanation.
			Total	**3**	
3			**Mark Band 3–High Level (9–12 marks)**	2	*Answers may include, but are not limited to, some of the points below.*

Question			Answer/Indicative content	Marks	Guidance
			The candidate demonstrates a thorough knowledge and understanding of methods of utilising large amounts of computing power. The material is generally accurate and detailed.	2	**AO1: Knowledge and Understanding**
				3	Processors have increasingly large clock speeds and can be overclocked.
			The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation.

The candidate is able to weigh up both sides of the argument which results in a supported and realistic judgment as to which approaches to provide increasingly larger amounts of computing power are best.
There is a well–developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.

Mark Band 2–Mid Level (5–8 marks)
The candidate demonstrates reasonable knowledge and understanding of methods of utilising large amounts of computing power; the material is generally accurate but at times underdeveloped.

The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed.
Evidence/examples are for the most part implicitly relevant to the explanation.

The candidate makes a reasonable attempt to come to a conclusion showing some recognition of which approaches to provide increasingly larger amounts of computing power are best.

There is a line of reasoning presented with some structure. The information presented | 5 | Processors can have multiple cores. Super computers can have multiple processors (and GPUs).
GPUs can be applied to problems other than graphics processing.
Problems can be distributed across a number of computers working together.

AO2.1: Application
Having multiple cores can speed up smaller problems but this will not be enough for larger problems.
Supercomputers are prohibitively exceptionally expensive to buy and run for all but large organisations.
GPUs are becoming a cost efficient way of tackling problems. GPUs tend to have large number of cores so can run on highly paralleliseable problems... …but only where the same instruction is being applied to multiple pieces of data (SIMD)

AO3.3: Evaluation
Increased clock speed is limited to smaller problems. Even doubling the clock speed would only halve the time taken.
Parallel processing isn't suited to all problems. Most problems are only partially parallelisable. Writing algorithms for parallel processing is more challenging than
GPUs suited to a subset of science/ engineering problems where the same calculation is repeated on multiple data sets. |

Question			Answer/Indicative content	Marks	Guidance
			is in the most part relevant and supported by some evidence.		
			Mark Band 1–Low Level (1–4 marks) The candidate demonstrates a basic knowledge of methods of utilising large amounts of computing power; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided.		
			The candidate provides nothing more than an unsupported assertion.		
			The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.		
			0 marks No attempt to answer the question or response is not worthy of credit.		
			Total	12	