1.2 Memory and Primary Storage: Test Pack

OCR J277 · Calculators not allowed · about 20 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Identify which type of memory is volatile, meaning its contents are lost when the power supply is removed.

- ☐ A) RAM
- ☐ B) ROM
- ☐ C) Hard disk drive (HDD)
- ☐ D) Solid state drive (SSD)

(Total for Question 1 is 1 mark)

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2 This question is about the use of hexadecimal to represent memory addresses.

(a) A memory location is addressed using the hexadecimal value 2C. Calculate this address in denary. **(2)**

.....

(b) State why programmers often use hexadecimal, rather than binary, when writing or reading memory addresses. **(2)**

(Total for Question 2 is 4 marks)

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3 A gaming computer's CPU cache size is increased from 4 MB to 8 MB. Explain the likely effect this will have on the performance of the CPU.

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(Total for Question 3 is 3 marks)

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4 A programmer wants to estimate how much memory (in bytes) a program will need to store some simple variables. Every INTEGER variable takes up 4 bytes and every CHAR variable takes up 1 byte.

Write an algorithm, using pseudocode, that:
- asks the user to input the number of INTEGER variables needed
- asks the user to input the number of CHAR variables needed
- calculates and outputs the total number of bytes required.

(Total for Question 4 is 5 marks)

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5 Laptop A and Laptop B have identical CPUs and the same amount of RAM, but Laptop A has a larger CPU cache than Laptop B.

(a) Explain, using the idea of cache hit rate, why Laptop A is likely to complete most everyday tasks faster than Laptop B. **(2)**

(b) Explain one situation in which Laptop A's extra cache would provide little or no performance benefit over Laptop B. **(2)**

(Total for Question 5 is 4 marks)

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Mark scheme · 1.2 Memory and Primary Storage: Test Pack

Question 1

A only oe **B1**

Answer: A) RAM

Question 2

(a) (2 x 16) + 12 shown **M1**

(a) 44 cao **A1**

(a) Answer: 44

(b) hexadecimal numbers are shorter/use fewer digits than the equivalent binary number **B1**

(b) this makes them quicker to read and write, and less prone to human error, than long strings of binary digits **B1**

(b) Answer: Hexadecimal represents the same value in far fewer digits than binary, making addresses quicker and easier for humans to read/write accurately.

Question 3

a larger cache can store more frequently/recently used instructions and data at once **B1**

this increases the cache hit rate (more of the CPU's requests are found in the cache rather than needing RAM) **B1**

so the CPU spends less time waiting for data from the slower RAM, increasing overall processing speed/performance **B1**

Answer: Doubling the cache size is likely to increase the cache hit rate, meaning the CPU less often has to wait for the slower RAM, so overall performance improves.

Question 4

correct input statement that stores the number of INTEGER variables (e.g. numIntegers = input("Enter number of integer variables: ")) **1 mark**

correct input statement that stores the number of CHAR variables **1 mark**

correct calculation of total bytes: (numIntegers x 4) + (numChars x 1) **1 mark**

total bytes correctly output, e.g. using print() **1 mark**

algorithm is logically complete and would run correctly overall; award marks for any correct logic and ignore minor syntax errors **1 mark**

Answer:

```
numIntegers = input("Enter number of integer variable
numChars = input("Enter number of character variables
totalBytes = (numIntegers * 4) + (numChars * 1)
print(totalBytes)
```

Question 5

(a) the larger cache can hold more of the instructions/data the CPU is currently using, increasing the cache hit rate **B1**

(a) so Laptop A's CPU has to wait for the slower RAM less often, allowing it to complete tasks faster **B1**

(a) Answer: Laptop A's larger cache gives a higher hit rate, so its CPU waits for RAM less often, completing tasks faster.

(b) identifies a scenario where the task's working data already fits entirely within Laptop B's (smaller) cache, e.g. a simple task using very little data **B1**

(b) in this case both laptops would already have a similarly high hit rate, so Laptop A's extra cache capacity would rarely be used / would give no noticeable speed advantage **B1**

(b) Answer: If the task's data already fits within the smaller cache, both laptops achieve a similarly high hit rate, so the extra cache in Laptop A gives no real benefit.

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