

科目：計算機結構與作業系統

適用：資工系

考生注意：

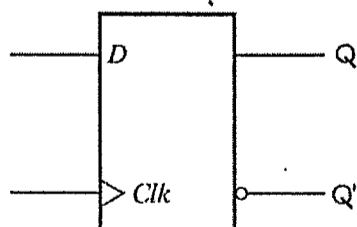
1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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1. (10 points) OS is an intermediate program between application programs and hardware. Under this view, what are the two main jobs of an OS?
2. (10 points) The memory access time is 100 ns if page fault does not happen. But if page fault does happen, the memory access time is X ns. Assume the page fault rate is 0.000005 and the effective access time does not exceed 120 ns. What is the maximum value of X?
3. (10 points) Explain why context-switch does affect the performance of cache.
4. (10 points) List any two privileged instructions.
5. (10 points) Answer Yes or No for following questions. Each correct answer gets 5 points.
 - (a) (5 points) Cache is useful only because it is faster than memory.
 - (b) (5 points) The name of a file, in UNIX implementation, is stored in its inode.
6. (20 points) For each of the following basic computer module, draw its block **diagram** including input, output, control signals and explain its **functionality**.
 - (a) (4 points) Multiplexor
 - (b) (4 points) Memory
 - (c) (4 points) Adder
 - (d) (4 points) Register file
 - (e) (4 points) Decoder

For example, the block diagram of a D flip-flop is shown below. Function of a D flip-flop is to transfer the value of D to Q, when the input clock makes a positive transition.

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7. (10 points) Transforming a C program to a program running on a computer typically goes through the translation hierarchy: **compiler, assembler, linker, and loader**. Explain these four terms, including their inputs, outputs, and how they work.

8. (10 points) The following table is the SPECINTC2006 benchmarks running on a 2.66 GHz Intel Core i7 920 PC.

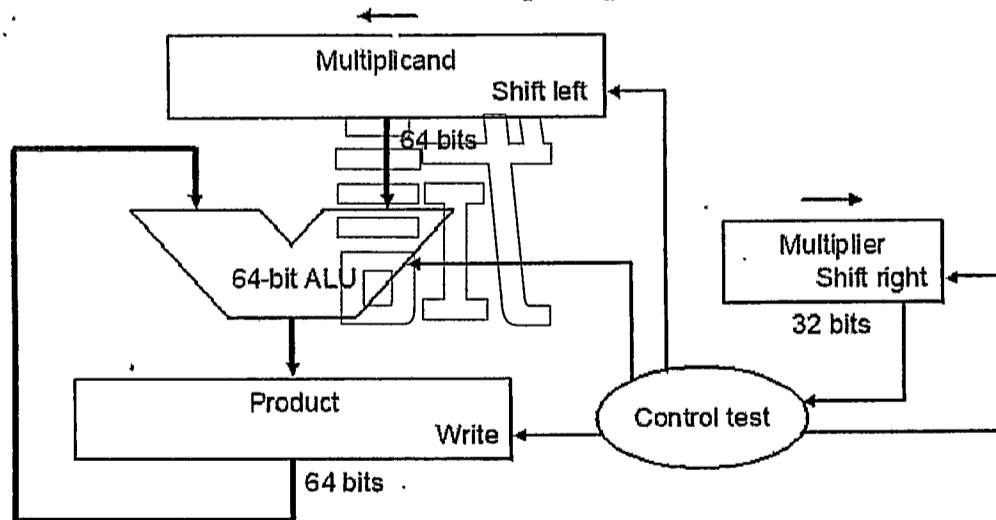
Description of test application	Instruction count $\times 10^9$	CPI	Clock cycle time (seconds $\times 10^{-9}$)	Execution time (seconds)
String processing	2252	0.6	A	B
Combinational optimization	221	2.66	A	C

* CPI = clock cycles per instruction

(a) (7 points) Calculate the values of A, B, and C in the table.

(b) (3 points) Explain why the CPI varies by more than a factor of 4 for the two applications in the table?

9. (10 points) A sequential version of a 32-bit multiplier is shown below. Draw a flow chart to describe the steps to perform multiplication.



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