

國立中正大學

113 學年度碩士班招生考試

試題

[第 1 節]

科目名稱	計算機組織
系所組別	電機工程學系- 計算機工程組 晶片系統組

—作答注意事項—

※作答前請先核對「試題」、「試卷」與「准考證」之系所組別、科目名稱是否相符。

1. 預備鈴響時即可入場，但至考試開始鈴響前，不得翻閱試題，並不得書寫、畫記、作答。
2. 考試開始鈴響時，即可開始作答；考試結束鈴響畢，應即停止作答。
3. 入場後於考試開始 40 分鐘內不得離場。
4. 全部答題均須在試卷（答案卷）作答區內完成。
5. 試卷作答限用藍色或黑色筆（含鉛筆）書寫。
6. 試題須隨試卷繳還。

國立中正大學 113 學年度碩士班招生考試試題

科目名稱：計算機組織

本科目共 2 頁 第 1 頁

系所組別：電機工程學系-計算機工程組、晶片系統組

1. (20%) Assume compiler A runs a program with a dynamic instruction count of $1.0E9$ and spends 1.1 s, and compiler B runs the same program with a dynamic instruction count of $1.3E9$ and computing time of 1.2 s.
 - (a). (10%) What is the average CPI for each compiler with a clock cycle time of 0.5 ns.
 - (b). (10%) A new compiler is that uses only $5.0E8$ instructions and has an average CPI of 1.2. What is the speedup of this new compiler comparing to compilers A and B?

2. (30%) As in the table, an MIPS CPU is designed with instructions and latencies. Assume the multiplexors, control unit, PC accesses, and sign extension unit have no delay.
 - (a). (10%) What is the critical path if the CPU is working as a single-cycle processor? Why?
 - (b). (10%) What is the minimum clock speed of the single-cycle processor?
 - (c). (10%) What is the minimum clock speed if the CPU is working as a multi-cycle processor?

Instructions	Instruction fetch	Register read	Control	Memory access	Register write	ALU
sub	300ps	100 ps	200ps		100 ps	100ps
sw	300ps	100 ps	200ps	300ps		100ps
add	300ps	100 ps	200ps		100 ps	100ps
beq	300ps	100 ps	200ps			250ps

3. (20%) Consider a segment MIPS code as below.
 - (a). (10%) Find the hazards in the preceding code segment.
 - (b). (10%) Reorder the instructions to avoid any pipeline stalls.

```

lw $s1, 0($t0)
lw $s2, 4($t0)
add $a3, $s1, $s2
sw $a3, 12($t0)
lw $s5, 8($t0)
add $a5, $s1, $s5
sw $a5, 16($t0)
    
```

國立中正大學 113 學年度碩士班招生考試試題

科目名稱：計算機組織

本科目共 2 頁 第 2 頁

系所組別：電機工程學系-計算機工程組、晶片系統組

4. (30%) Assume an adder-subtractor CPU circuit is composed of full-adder (FA) as in the figure. Please find the value for:

- (a). (10%) Find value at (A_1, b_2, C_1, V, M) for $A-B = 0-0$.
- (b). (10%) Find value at (b_0, C_1, A_2, S_2, M) for $A-B = -1-(-2)$.
- (c). (10%) Find value at (A_1, B_2, C_3, S_1, M) for $A-B = 0-2$.

