

國立高雄應用科技大學
100 學年度碩士班招生考試
電子工程系（丙組）

准考證號碼 （考生必須填寫）

計算機結構

試題 共 3 頁，第 1 頁

注意：a. 本試題共 8 題，共 100 分。

b. 作答時不必抄題。

c. 考生作答前請詳閱答案卷之考生注意事項。

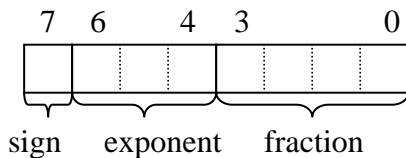
1. Refer to the following code segment in MIPS instruction set architecture. (10%)

(a) Explain the operation performed by each instruction.

(b) What value is in register t0 after the execution of this code segment?

```
addi    $t0,$zero,0
addi    $t1,$zero,0
addi    $t2,$zero,10
LOOP:   addi    $t1,$t1,1
        add     $t0,$t0,$t1
        bne    $t1,$t2,LOOP
```

2. Consider the following fictional floating-point number representation inspired by IEEE 754 with an exponent bias of 3. (15%)



(a) Represent 5_{10} using the representation.

(b) Represent 0.1875_{10} using the representation.

(c) Represent $5_{10} + 0.1875_{10}$ using the representation.

3. Assume that multiply instructions take 12 cycles and account for 20% of the instructions in a typical program, and the other 80% of the instructions require an average of 4 cycles for each instruction. A proposal of performance improvement can reduce the number of cycles required for multiplication to 8 cycles, but requires a 20% increase in the cycle time. Is this proposal profitable in execution time? Please justify your answer (10%)

4. For a multi-cycle CPU, the frequency of occurrence and number of required cycles of 5 classes of instructions are tabulated as follows. Please evaluate the weighted average CPI (Cycle per Instruction). (10%)

Instruction Class	Frequency of Occurrence	Number of Required Cycles
Load	25%	5
Store	10%	5
ALU Instruction	50%	3
Conditional Branch	10%	4
Jump	5%	4

5. The 5 stages and the time they take in the execution of an instruction are listed below. Please evaluate the time it take to execute 10 instructions for (10%)

(a) A single-cycle machine.

(b) A pipeline machine.

IF	ID	EX	MEM	WB
15 ns	10 ns	10 ns	20 ns	10 ns

6. List and explain those “hazards” in applying pipelining technique to CPU design for improved performance in instruction execution. (10%)

7. For a typical memory system, (15%)

(a) Draw the entire memory hierarchy, from registers in CPU down to auxiliary storage, indicating the trend of access speed, size and unit cost.

(b) Explain the similarity and difference between the concepts of cache memory and virtual memory.

8. Explain the following terminologies. (20%)
- (a) Microcode
 - (b) CISC vs. RISC
 - (c) Translation-Lookaside Buffer
 - (d) Direct Memory Access
 - (e) SIMD (in the context of multiprocessor)