

國立臺北科技大學九十六學年度碩士班招生考試

系所組別：1710 電腦與通訊研究所甲組

第二節 計算機結構 試題

第一頁 共二頁

**注意事項：**

1. 本試題共五題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1.) Answer these 2 questions.

(a) What is the Amdahl's Law ? (5%)

(b) The execution time of the program in the parallelized machine needs 100 seconds, which consists of 80 seconds in the parallelized portion (called enhanced portion) and 20 seconds in a serial portion. If you want to finish this program by speedup quadruple (增速四倍) than the previous method, what is your solution to improved the parallelized portion ? Verify and explain your answer. (10%)

2.) Use the R-S Flip-Flop and other components to design the internal structure of the basic SRAM (Static Random Access Memory) with 4 address (00, 01, 10, and 11) and 4-bit (bit0, bit1, bit2, and bit3) data-bus in details. Your decoder can be in a block method to represent. (20%)

3.) Consider the 14\*4 Torus that forms the interconnection network linking nodes in the NTUT parallel computer.

(a) What is the definition of a diameter in a parallel computer ? (5%)

(b) Draw and label this 14\*4 Torus. (5%)

(c) What is the diameter of this network ? Explain your answer. (5%)

(d) The minimum number of edges needs to break it into two disconnected parts, each having the same number nodes (this is the bisection width). (5%)

4.) Your company has a benchmark that is considered representative of your typical applications. One of the old-model workstation does not have a floating-point unit and must emulate each floating-point instruction by a sequence of integer instructions. This old-model workstation is rated at 120 MIPS on this benchmark. A third-party vendor offers an attached processor that is intended to give a "mid-life kicker" to your workstation. That attached processor executes each floating-point instruction on a dedicated processor (no emulation is necessary). The workstation/attached processor rates 80 MIPS on the same benchmark. The following symbols are used to answer parts (a)-(d).

I: Number of integer instructions executed on the benchmark.

F: Number of floating-point instructions executed on the benchmark.

Y: Number of integer instructions to emulate a floating-point instruction.

W: Time to execute the benchmark on the workstation alone.

B: Time to execute the benchmark on the workstation/attached processor combination.

(a) Write an equation for the MIPS rating of each configuration using the symbols above. Document your equation. (5%)

(b) For the configuration without the coprocessor, we measure that  $F=8 \cdot 10^6$ ,  $Y=50$ , and  $W=4$ . Find I. (5%)

(c) What is the above value of B ? (5%)

(d) What is the MFLOPS rating of the system with the attached processor board ? (5%)

注意：背面尚有試題

5.) In a general purpose PIO-8255 (programmable Input/Output), there are 4 port addresses (00, 01, 10, and 11), port A, port B, port C, and control register. The hardware design is shown in the following figure. The control word format of PIO-8255 is as follows, D7 (1=I/O mode, 0=BSR mode), D6D5 (mode selection, 00=mode0, 01=mode1, 1x=mode2), D4 (port A, 1=input, 0=output), D3 (PC7-PC4 of port C, 1=input, 0=output), D2 (mode select, 0= mode0, 1=mode1), D1 (port B, 1=input, 0=output), and D0 (PC0-PC3 of port C, 1=input, 0=output). Note that D2-D0 is the group B and D6-D3 is the group A.

- (a) Find the port addresses assigned to A, B, C and control register for this configuration. Explain your answer. (5%)
- (b) Find the control byte for this configuration. (5%)
- (c) Set AL(8-bit) to data 55H here. Program this PIO-8255 to send the data from AL of CPU to ports A, B, and C for this configuration. Explain your answer. For example, you can use the Move, IN, and OUT instructions or others. (10%)
- (d) Prove and suggest the hardware engineer in a better solution to correct this structure. Explain your answer in details. (5%)

